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ABSTRACT

Environmental concepts provide the foundation upon which curriculum planners/developers construct environmental education programs. Research literature in environmental education was searched for lists of concepts, procedures used in validating concepts, and evidence of empirical investigations into the underlying structure of a set of concepts. Based upon this review, a set of 111 concepts developed by Robert E. Roth (Appendix A) was selected and reduced to 54 (Appendix B) by an interdisciplinary panel of experts. The refined list was then reviewed for accuracy of concept statements and validity as fundamental concepts on which to base a general program of environmental education. This validated set of 54 concepts became the Q-sort instrument for this study, administered randomly (along with an information sheet) to selected members of two groups: university (N=100) and environmental organizations (N=100). As a result of the study, a current validated set of concepts for use in developing environmental education programs was produced, underlying dimensions of these concepts were developed and named, and personal background variables (which correlated with the underlying dimensions of the concept set) were identified and their significance as predictors determined. (Author/JN)

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AN INVESTIGATION INTO THE UNDERLYING STRUCTURE OF THE DOMAIN OF ENVIRONMENTAL EDUCATION CONCEPTS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Robert Donley Townsend, B.A., M.A.

* * * * *

The Ohio State University

1982

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The love, kindness and understanding of my wife, Thea, enabled me to continue the study in sometimes difficult circumstances. My parents, James and Margaret Townsend, also gave unstintingly of their love and encouragement. They made all this possible.

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Chapter I

Introduction

Need for the Study

Man, in the 1960's, began to express an increased concern for the quality of the human environment. The existence of an ecological crisis was recognized and well documented. In 1962, Rachel Carson's best selling book, The Silent Spring, woke the nation to the threats posed by DDT and other once-heralded pesticides. Countless numbers of books, articles, and films that informed the masses about the environmental crisis and foretold the impending consequences followed.

Still, the mid-to-late 1960's produced no environmental movement worthy of the name. Individual conservation groups fought private battles over the Dinosaur National Monument, the California redwoods and the Cascades in Washington, but cooperation among groups was rare or totally lacking.

Then came April 22, 1970 -- the first Earth Day. The phenomenon was suggested by Senator Gaylord Nelson, D-Wi, and inspired by the 1969 demonstrations against the Vietnam War. More than 20 million Americans participated in Earth Day marches, rallies, teach-ins and local clean-up campaigns. With the endorsement of the environmental crusade by the Nixon Administration, environmentalism entered the American mainstream.

The 1970's were a decade of historic environmental achievement. America, and indeed the world, woke up to the realization that life and

its sustaining resources were endangered. Finally, people began to realize that the world is not a cornucopia. There are limits to resources, limits to air, water and land, and limits to earth's ability to sustain life.

The impact of the environmental movement of the 1970's colors almost every thread in the fabric of American society from air pollution control limits for automobiles to alternatives in waste disposal. Many landmark pieces of legislation were enacted during the 1970's including: the Clean Air Act, the Clean Water Act, the Toxic Substance Control Act, the Resource Conservation and Recovery Act, the National Environmental Policy Act, and the Safe Drinking Water Act. Two new governmental bodies, the council on Environmental Quality and the Environmental Protection Agency, were created. New national groups were formed, among them the Natural Resources Defense Council (1970), Friends of the Earth (1970) and Environmental Action (1970). By 1973, an estimated 20,000 local or national environmental groups and allied citizens' organizations, such as Common Cause and the League of Women Voters, existed.

Historically, Americans have reacted to social movements by creating educational programs. Concern about the environment was no exception. Bowing to pressure from conservationists, educators, public officials and concerned citizens, Congress passed the Environmental Education Act of 1970. The purposes of the act were:

> to encourage and support the development of new and improved curricula, to encourage understanding of policies, and support of activities designed to enhance environmental quality and maintain ecological balance; to demonstrate the rise of such curricula in model educational programs and to evaluate the effectiveness

> thereof; to provide support for the initiation and maintenance of programs in environmental education at the elementary and secondary levels; to disseminate curricular materials and other information for use in educational programs throughout the nation; to provide training programs for teachers, other educational personnel, public service personnel, and community, labor, and industrial and business leaders and employees, and government employees at state, federal and local levels; to provide for the planning of outdoor zoological study centers; to provide for community education programs on preserving and enhancing environmental quality and maintaining ecological balance; and to provide for the preparation and distribution of materials by mass media in dealing with the environment and ecology (Public Law 91-516).

On the occasion of the first annual report on the Council on Environmental quality, (1970) President Nixon stated in a message to Congress that

> "We must seek nothing less than basic reform in the way our society looks at problems and makes decisions. Our educational system has a key role in bringing about this reform. It is vital that our entire society develop a new understanding and a new awareness of man's relation to his environment that might be called 'environmental literacy.' This will require the development and teaching of environmental concepts at every point in the educational process." (p. vii)

Sidney Marland, the then U.S. Commissioner of Education declared that the long range objective of education must be to "bring concepts of environmental education into virtually every aspect of learning." (Marland, 1970).

Historically, American society has been highly dependent upon its higher educational institutions to identify the pieces of information (concepts) deemed appropriate for use in the schools. In that time of great concern about environmental matters, the major question in education became: What should a citizen know about the environment?

The strength of environmental education programs depends upon the development and implementation of a virile conceptual core. Emphasizing

work done earlier in the era of conservation and outdoor education, studies dealing with the identification and selection of concepts appropriate for the interdisciplinary arena of environmental education began to appear.

Roth (1969), in the pioneer effort in environmental education, identified, compiled, and produced a taxonomy of 111 environmental management concepts in fourteen (14) categories for use in the development of educational programs. Other lists of concepts, fundamental ideas, or basic understandings soon followed: Ronfeldt (1969), Allman (1972), Isabell (1973), and Rentsch (1973). The Subcommittee on Environmental Education of the Federal Interagency Committee on Education (FICE, 1976) set forth a framework of fundamentals about the Earth's environment.

In each case, although the validation methods differed, opinions of professionals in environmentally-related fields on the relative importance of a set of statements representing the major concepts related to the environment were solicited. Collectively, these statements were seen by those developing them as representative of the structure of environmental education. The statements are believed to provide the basis by which individuals design and interpret new observations. Thus the role of environmental education is to facilitate transmission of concepts from the conceptual structure of the discipline to the cognitive structure of students.

The environment is a complex entity. Thus, knowledge about the environment consists of a large matrix of interrelated concepts, generalizations and principles. There is no single identifiable set of concepts which summarizes all knowledge about the environment. Any number of "concepts," "major concepts," "fundamental ideas," or "generalizations"

valid for a particular frame of reference can be identifed and each would be valid within that frame.

Research and development within the realm of conservation, environmental and science education has produced many "exhaustive", "all inclusive" lists of concepts, major concepts, fundamental ideas, or generalizations. A representative list of the research and the number of concepts identified in each includes:

Robertson (1935)	113 concepts
Wise (1941)	270 concepts
Martin (1944)	300 concepts
Caldwell (1954)	332 concepts
Visher (1959)	477 concepts
Trainor (1964)	387 concepts
White (1967)	271 concepts
Roth (1969)	111 concepts
Allman (1972)	113 concepts

While there may be merit in identifying "all" the concepts within a particular discipline at some point the large number of concepts overwhelms the curriculum planner/developer; it is impossible to consider all statements concomitantly while planning activities. Novak (1977) states that knowledge within a discipline can be divided into any number of concept statements, but it is likely that there is an optimal number of statements. Miller (1956) argues that people are severely limited in the amount of information they can consider at a given time and conclude that, depending upon the type of data, humans can retain seven, plus or minus two, independent "chunks" of information.

Glass (1965) reports that during the NSTA Conference to prepare Theory into Action, the writers found it difficult to constantly keep in mind the nine themes that were to permeate their work. Miller's "seven-plus-or-minus-two" argument may account for the difficulty the team found in using the nine themes.

The implications of Miller's work to teaching about the environment are far reaching. If indeed the optimum number of concepts is seven plus or minus two, how can we expect teachers, curriculum planners, and students to effectively utilize or learn the more than one-hundred different concepts that have been identified in the literature of environmental education.

Miller provides an answer:

> Since the memory span is a fixed number of chunks, we can increase the information that any one chunk contains simply by building larger and larger chunks; each chunk now containing more information than before.

These chunks or major concepts have become what Ausubel (1960) calls comparative organizers. These concepts can be used by the student at successive grade levels to aid in the organization and learning of new information. Study about the environment becomes not the repeated experience of memorization of unrelated facts, but the constant search for the relationships between new information and a continuously developing concept base. Thus, the learning of a few "super" concepts enables the learner to subsume many subordinate concepts.

Roth and Helgeson (1972) and Roth (1976) note that few studies have been designed to identify concepts, principles, or understandings for use in teaching about the environment. Roth (1979) states that "little information exists concerning the big ideas to be communicated, concepts to be taught, or conceptual objectives to be interpreted in environmental education." Roth (1980) emphasizes the need to study the organization of environmental concepts for determination of effective conceptual structures for teaching purposes and stresses the need for the validation of more recent concept lists, soliciting a wide array of opinion, not only from

educators but from individuals/groups outside the higher education community. Roth concludes that environmental education research efforts that relate to the empirical documentation of concepts and concept acquisition are urgently needed. The time for the development of rigorous research strategies is now.

Summary

From the foregoing discussion, the following needs have been inferred:

(1) There is a need to validate and refine a current list of environmental concepts in order to provide information for use by educators in the planning and development of programs related to environmental education.

(2) There is a need to ask individuals with varied educational and experiential backgrounds to specify the importance of each of the elements of a set of concepts on the environment.

(3) There is a need to infer what constitutes the underlying structure (dimensions) of the domain of a set of environmental concepts in the minds of the individuals who are asked to attach importance to the elements of the set.

(4) There is a need to find predictors of the underlying dimensions of a set of environmental concepts.

Statement of the Purpose

The purpose of this study is to validate and determine the relative importance of a set of environmental education concepts. This study investigates the underlying structure of the domain of a set of environmental education concepts as perceived by two groups of individuals representing colleges/universities and environmental organizations. The study also explores predictors of these underlying dimensions.

Statement of Related Tasks

The related tasks for this study are as follows:

(1) To identify a set of concepts for use in programs of instruction (K-16) in environmental education.

(2) To determine the relative importance of each of the concepts for inclusion in environmental education programs for kindergarten-adult levels.

(3) To identify underlying dimensions of environmental education concepts through empirical methods and compare them with the dimensions (concept categories) identified by Roth (1969) and Bowman (1972).

Statement of the Problem

The research problems for this study are as follows:

(1) To determine what relationships exist between the relative importance of selected concepts in environmental education and the variable, group membership (university versus environmental organization).

(2) To identify the underlying dimensions of a set of environmental education concepts from the perceived importance as reported by two groups of individuals representing colleges/universities and environmental organizations.

(3) To compare the rating of importance of the underlying dimensions of concepts for the university group and the environmental organization group.

(4) To determine what relationships exist between the underlying dimensions of concepts and the variables: (a) age; (b) sex; (c) amount of education; (d) publications read; (3) automobile(s) owned; (f) housing; (g) television viewing patterns; (h) community involvement; and (i) population of county of residence.

Hypotheses

The hypotheses of this study are as follows:

Hypothesis 1. There will be significant differences in the relative importance of selected concepts in environmental education as related to group membership (between university and environmental organizations).

Hypothesis 2. There are significant differences in the factor scores of the university representatives and the representatives from environmental organizations on each of the underlying dimensions of concepts.

Hypothesis 3. There are significant predictors or combinations of predictors among the variables : (a) age; (b) sex; (c) amount of education; (d) publications read; (e) automobile(s) owned; (f) housing; (g) television viewing patterns; and (h) community involvement; and (i) population of county of residence and the underlying dimensions of the set of environmental education concepts.

Definitions

Academic discipline: an identified area of study or specialization; as chemistry, botany, agriculture, or parks and recreation management.

Biophysical environment: the biological and physical aspects of environment with which a man interacts and from which he obtains life supporting sustenance and natural resources (Roth, 1969).

Concept: a summary of the essential characteristics of a group of ideas and/or facts that epitomize important common features of factors from a larger number of ideas (Pella, 1966 as used by Roth, 1969).

Culture: the shared products of human learning.

Dimension of Concepts: a recognizable group of characteristics (Gabel, 1976).

Environmental Concepts Q-set (ECQ): a group of fifty-four (54) statements compiled for this study.

Factor analysis: a statistical method for determining the number and nature of the underlying variables among larger numbers of variables (Kerlinger, 1973).

Inferred dimension: the commonality believed to be shared by the group of ECQ statements.

Information sheet: a questionnaire developed for this study designed to elicit information about (a) age and sex; (b) amount of education; (c) publications read; (d) automobile(s) owned; (e) housing; (f) television viewing patterns; and (g) community involvement.

Management: the intentional and rational manipulation of objects or events to achieve a predetermined end, goal, or objective (Roth, 1969).

Organization: a non-governmental unit (Disinger, 1980).

Q-sort technique: a method of eliciting responses by having subjects sort a series of items into a prescribed number of piles along a descriptive continuum (Emmert, 1970).

Respondent: a person who completed both the ECQ and the information sheet.

Sociocultural environment: social systems within which individuals and groups with different cultures participate and interact (Roth, 1969).

Assumptions

This study assumes that:

1. The list of concepts developed by Roth (1969) represents the most comprehensive and useful set of concepts available for this study.

2. The concepts presented in this study do not represent all of the useful concepts.

3. The persons selected to respond to the Information Sheet and the ECQ represent the groups of persons from which they were drawn.

4. Representatives from higher education and environmental organizations will have opinions as to what concepts should be included in environmental education.

5. Persons involved with environmental education in higher education and representatives of environmental organizations functioning in a public education or information capacity are knowledgeable concerning the environment and are qualified to judge the relative importance of concepts in environmental education.

6. The respondents sorted the ECQ statements according to instructions.

7. The respondents accurately completed the Information Sheet; supplying the correct information to the best of their knowledge.

8. Q Methodology is an appropriate means of measuring an individual's perception of the relative importance of concepts.

9. Underlying dimensions of the domain of a set of environmental concepts can be developed from an individual's perception of the relative importance of the concepts within the set.

Limitations

1. Subjective judgements on the part of the respondents were the source of data for this study.

2. Subject participation in this study was voluntary.

3. This study is limited by the representativeness of the Conservation Directory - 1979 and The United States Government Manual (1979-1980) as sources of environmental organizations.

4. The generalizability of the results of this study is limited to the representativeness of the 60% of the sample that participated.

Overview of the Study

Chapter II is a review of the related literature necessary to develop this study. Chapter III describes the ECQ, the university and environmental organization groups, the variables considered and procedures used in the study, and the analysis used on the data. Chapter IV describes the results and provides an analysis of the data. Chapter V reports the conclusions, implications and recommendations related to the research.

Chapter II

Review of the Related Literature

Introduction

This study focuses on a concern that is common to all environmental educators: What knowledge about the environment should be taught and included in the education of individuals? The growth of scientific knowledge has been great in recent years and continues to accelerate rapidly. The very nature of science itself contributes heavily to the knowledge explosion; each problem solved opens the door to the new problems. The broadly trained scientist of 150 years ago could, and probably did, know all of the major concepts (principles) of biology, chemistry, and physics. However, with the quantity of knowledge now doubling in less than ten years, this explosion makes it probable that an individual will be able to master knowledge in at most one confined area of science.

The implications for education seem apparent. As Novak (1966) concluded:

> Education based on individual facts of principles will become increasingly ineffective; whereas, education focused on development of understanding of the major concepts of science may become progressively more successful. The task of education becomes the identification of those major concepts. (p. 241)

Many educators have claimed that transfer of learning is greatly facilitated by organizing the learning experience about concepts. Taba (1962) notes that "any enterprise as complex as curriculum development requires some kind of conceptual framework to guide it."

Bruner (1962) declares that "the idea of concepts and principles as a basis of transfer is hardly new." Kuslan and Stone (1968) also advance the same argument: "Learning which is conceptually oriented is much less likely to be forgotten than learning based on isolated facts and principles." Toulmin (1972) declares that although concepts change from time to time and may vary from culture to culture, a person's grasp of a discipline's concepts is the basis of understanding in that field. Schwab (1962) argues that the structure of a discipline consists, in part, of a body of imposed concepts that define the subject matter of that discipline.

Prior research which influenced the design and development of this study originates from a number of topical areas including:

1. Referent terms for concepts;
2. Key studies in conservation education concept development;
3. Studies dealing with the development of environmental education concepts;
4. Studies dealing with the categorization and structure of environmental education concepts;
5. Q-sort techniques

The relationships among the above topics in this study are indicated as appropriate.

Referent terms for concepts

A review of the literature related to concepts and concept formation indicates little agreement on the definition and use of the term "concept." In the literature of environmental education, one can find the following terms used interchangeably: (1) concept, (2) conceptual scheme, (3) major concept, (4) fundamental idea, (5) theme, (6) principle, (7) major principle, (8) major generalization, and (9) organizational thread or strands.

Pella (1975) goes so far as to state that the vocabulary used from sources such as science, engineering, and philosophy "has been prostituted to the point where any one word regardless of context, represents as many concepts as the people who use it."

While this relaxed use of referent terms for concepts may be distressing to some individuals and groups, most environmental educators seem to prefer not dwelling upon the definition of terms, but choose instead to consistently use the referent term they feel is applicable and then provide examples or illustrations. Novak (1977) succinctly summarizes the situation:

> While little agreement exists on the definition of the term concept, there is a tendency to limit the use of this term to a relatively simple aggregation of experience. Usage of this term is of little value to individuals interested primarily in classroom instruction and it is not likely that these individuals will change their language patterns to fit the definition.

Therefore, this study will consistently use the term concept in lieu of the other referents and apply the definition of concepts as formulated by Pella (1966) and used by Roth (1969):

> A concept is a summary of the essential characteristics of a group of ideas and/or facts that epitomize important common features of factors from a large number of ideas.

Pella (1966) notes that concepts involve the development of classifications or descriptions of objects or phenomena in nature, the relating or correlating of one or more facts with other facts, and the development of theories useful in explaining observations. He has identified the following characteristics of concepts:

1. Concepts are ideas possessed by individuals or groups. They are a type of symbolism.

2. Concepts of any particular object, phenomenon, or process exist in a continuum from simple to complex.

3. Concepts emerge as a result of experience with more than one object, phenomenon or fact. They are generalizations.

4. Concepts are the result of abstract thinking that embraces the many experiences.

5. Concepts involve the relating of facts or supposed facts to each other by the individual.

6. Concepts are not always based upon a physical encounter.

7. Concepts are not inherent in nature or reality.

8. Concepts are not photographic images of reality.

9. Concepts are neither true or false; they are, rather, adequate or inadequate.

10. Concepts have five primary relationships; relations to people, relations to things, relations to other concepts, relations within conceptual systems, and relations to processes.

11. Concepts are useful in making predictions and interpretations.

12. The individual concept formed in any area may be determined by the sequence of the sensory experiences received or available.

13. The individual concepts formed in any area may be determined by the cultural pattern at the time of formulation. As the culture changes, the meaning and value of a given concept may change.

14. The nature of a concept may be determined by the procedure that led to its formulation.

15. Concepts and conceptual schemes are rendered inadequate as a result of new knowledge and must undergo constant revision.

Key Studies in Conservation Education Concept Development

By 1950, the importance of well-advised conservation practices had become so well accepted that the Twenty-Ninth Yearbook of the American Association of School Administrators was devoted to the promotion and implementation of conservation practices into the school curricula. While the approach was agrarian, in focus, many descriptions and suggestions for the development of programs at the state and regional levels

were advanced. Also included were suggested curricular materials and guides.

An excellent review of the literature relevant to the development of conservation education from the late nineteenth century, through the Nature Study and Progressive Education Movements, and up to the late 1960's to the beginnings of the environmental education movement is provided by Roth (1969). Therefore, this part of the review focuses on four (4) studies Visher (1960), Yambert (1960), Hanselman (1963) and White (1967) that provided the firm foundation for the emerging studies in environmental education concept identification and development that began to appear around the beginning of the Environmental Decade - 1970.

Visher (1960) identified conservation education concepts appearing most appropriate for use in the secondary schools. Four doctoral dissertations, five publications intended for use by teachers, two conservation journals, nine books on conservation and fifteen conservation textbooks served as the source of the concept statements. The list of statements was submitted for refinement and analysis to eleven specialists in conservation representing a wide range of training and experience. The refined list was then submitted to five nationally recognized leaders in secondary education for selection of the most appropriate concepts. The study produced 477 concepts deemed appropriate for inclusion into the secondary school curriculum. The concepts were classified into the following categories: water-56, forests-55, soil-85, minerals-57, grasslands-20, wildlife-38, recreation and science resources-37, and general conservation-78. This study expanded the number and increased the quality of concepts for conservation education,

but the overall emphasis was still on the agrarian nature of conservation.

From the analysis of materials written for conservation education at the elementary and secondary level, Yambert (1960) developed a framework of conservation concepts emphasizing a less agrarian and a more holistic approach for conservation. The study formulated twelve broad concepts. Yambert contended that other concepts could be chosen to fit specific situations, but that the twelve general concepts could serve as a manageable base from which to develop a conservation curriculum. Yambert's study greatly reduced the number of concepts to be considered in the development of conservation education programs and went beyond the agrarian orientation of conservation education that was so prevalent at this time.

Hanselman (1963) designed a study to explore the scope of conservation education offered students at The Ohio State University. Particularly, he investigated the current status of interdepartmental conservation-related teachings presented through the university's large enrollment courses. Study procedures included: (1) a review of the literature to identify a list of key concepts which should be included in conservation education; (2) refinement of the list by twenty-four (24) leading conservationists, that is biologists, economists, geographers, etc.; and (3) development of an eighteen-page topic survey and a two-page opinion questionnaire to be used along with informal interviews with each of 54 cooperating professors. The study produced a list of 108 conservation related topics covering fifteen (15) areas of conservation. Professors involved in the study indicated a strong interest not only in conservation, but also in its improvement. Hansel-

man's study laid the groundwork for the development of a strong conservation program through interdepartmental and interdisciplinary approaches. Hanselman's keen insight and perception of the true nature of conservation education may have in fact set the cornerstone for the "about to emerge" concept of environmental education.

White (1967) directed his attention to the development of conservation understanding appropriate for use in grades four through twelve and the identification of community resources that would be helpful in teaching these understandings. As was becoming the pattern in studies of this type, the initial list of understandings was developed through an examination of the relevant literature and the resulting compilation was organized into nine resource areas for evaluation by a panel of thirty people. The panel consisted of teachers at the elementary and secondary level and professional conservationists and natural resources personnel. Each panel member rated each concept on a 5 to 1 rating scale, with a rating of 5 placing the understanding in the "most desirable" category. The criterion for acceptance was a mean score of 3.0 on the item. Of the 274 understandings evaluated, 271 met the criteria. The understandings were further classified into two groups: 103 of the understandings were deemed appropriate for field study and 168 for use in the classroom. White concluded that all of the understandings held potential for community involvement as they were associated with community resources in the geographic area in which the study was conducted. One finding of this study frequently overlooked is that a significant difference in opinion on the majority of the understandings was observed between the professional conservationists and the

college teachers.

Studies Dealing with the Development of Environmental Education Concepts

Studies identifying concepts as being "environmental" began to appear in the literature in 1969. Roth (1969) using survey techniques to obtain and validate appropriate environmental management education concepts, identified fundamental concepts for environmental management education. These techniques involved wirtten questionnaires and personal interviews. A literature review served as the initial source of concepts. This review generated a list of 128 concepts which became the key element of the questionnaire which was mailed to 699 members of a national panel representing 40 academic disciplines in 24 universities from the 12 ecological zones of the United States. Responses were received from 350 of 699 (50.7%) members of the panel. Of the 128 concepts, 111 met the criterion for acceptance by 90% of the respondents. The concepts were divided into thirteen topical categories with the number of concepts specified in each category in parentheses: economics (18), environmental management (16), natural resources (13), socio-cultural environment (10), adaptation and evolution (9), management techniques (8), environmental ecology (8), the individual (6), politics (5), culture (4), psychological aspects (4), environmental problems (3), and the family (1).

Roth's 1969 study was unique for two reasons: (1) the broad sampling of disciplines outside an area that was considered to the realm of conservation education produced a truly interdisciplinary taxonomy of concepts, and (2) the number of interviews and concept reviews, plus the quality and size of the review panels and study sample seem to ensure that the results of the study were highly generalizable,

Ronfeldt (1969) identified a list of urban environmental understandings for inclusion in elementary school curricula. From a review of relevant published materials, Ronfeldt identified an initial list of 104 understandings. A panel of 90 elementary teachers and conservationists identified 90 as important and 43 were selected as being both important and basic to knowledge of the urban environment. The understandings were classified into five categories: air, land-use, man-made resources, water, and urban ecology. Ronfeldt concluded from the results of the study that urban environmental education understandings should be integrated into existing disciplines.

Isabell (1972) identified concepts for use in the development of instructional materials for environmental education. Isabell stated that existing concept lists were too long to be practical and hypothesized the need for a comprehensive, moderate length list. The resulting list of nine concepts was ecologically-oriented and pertained to the functioning and stability of an ecosystem. Using the concepts as a basis, Isabell then suggested some implications of human interaction with the environment and supported the interdisciplinary approach to environmental education.

Allman (1972) identified concepts to be included in elementary environmental education curricula. The concepts were developed through the use of the Delphi Survey Technique. The concepts were refined and approved by a national sample of 87 education and curriculum specialists. The concepts were classified into the following categories: general, air pollution, balance in nature, conservation of forests and timber, conservation of human resources, noise pollution, conservation of land

resources, problems in the city, wise use of mining and minerals, conservation of water resources and preservation of wildlife. Allman: (1) emphasized the multidisciplinary nature of environmental education; (2) suggested that the concepts identified could be presented at any grade level; and (3) recommended that the classroom teacher be the one who selects the concepts to be taught in the classroom.

Rentsch (1973), in the development of An Instrument to Measure the Minimal Understanding and Knowledge Possession Levels in Ten Environmental Concept Categories of an Environmentally Literate Citizenry, identified ten concept areas with twenty-nine component concepts. The ten categories are: Spaceship Earth Closed System, Biosphere, Human Ecosystem, Change, Environmental Quality, Population, Environmental Degradation, Recycling, Land Ethic, and Decision Making. Rentsch suggested these concept categories and concept components be the minimal understandings for an environmentally literate citizenry. Rentsch proposed that the instrument which measured the understanding level of the environmental concepts and the possession level of knowledge of facts, organization and substractions, be used to identify the environmental literacy level of a teacher education school's faculty and student body. He urged that appropriate steps be taken to achieve the 90/50 criterion (90% of the population getting 50% of the items correct).

Cauley (1971), in a study using Roth's 111 environmental management concepts, concluded that 52 of the concepts were applicable to industrial arts education. He suggested their implementation into the following areas: wood, metals, drafting, and graphic arts.

Other studies, though not producing the volume of concepts as those previously detailed, are worthy of mention. They represent the school of thought that the specificity generated by large numbers of concepts was not desirable and in fact, this specificity limited the utility of the concept.

Southern (1967) formulated twelve broad understandings to establish the framework for Natural Resources Education:

1. Natural resources are everything man uses. They are in constant redefinition.
2. Man is dependent on the renewable resources for his survival.
3. Our industrial civilization depends on the nonrenewable resources--the metals and fossil fuels.
4. Living things are interdependent with each other and with the physical environment.
5. Man as all other living things, is subject to the laws of nature.
6. Change is a fact of environment. It is dynamic and inevitable.
7. The pressures of population and urbanization accelerate and increase resource use.
8. The amount and rate of resource use is determined by the economy.
9. Environmental quality cannot always be easily defined in economic terms.
10. Man has learned to use his environment wisely in a number of ways.
11. Government is active in the discovery, development, management, and protection of resources.
12. Everyone has the responsibility for conserving the resources around him.

Brennan (1969) suggests that there are three major concepts dealing with the environment:

1. Living things are interdependent with one another and with their environment.

2. Organisms (or populations or organisms) are the product of their heredity and environment.

3. Organisms and environments are in constant change.

Stegner (1971) recommends that environmental education should include the following population environment concepts:

1. The earth is a finite natural system. (To show that there are limits.)

2. The evolution of the primates resulted in a capacity for culture. (To relate man to the natural system.)

3. The natural system influenced the evolution of human culture. (To indicate man's dependence on the natural system.)

4. Cultural evolution led to dominance of the environment. (To indicate man's uniqueness and power.)

5. The activities of human populations may lead to conditions restricting the quality of life. (For awareness of population-environment problems.)

6. By planning with the natural system, a life of acceptable quality can be provided for all people. (To suggest some choices.)

Cochran and McCrea (1974) proposed the following concept statements for population education:

1. Mathematical science is an integral part of demography.

2. Population growth is a world problem.

3. Population pressures exacerbate urban problems.

4. Family size and composition affect individuals.

5. Individual acts have demographic consequences.

6. The world's resources are finite.

Warpinski's Project I-C-E (1973), modified selected concepts from Roth's (1969) list and used the following 12 concepts as the basis of

his interdisciplinary curriculum project.

1. Energy from the sun, the basic source of all energy is converted through plant photosynthesis into a form that all living things can use for life processes.

2. All living systems interact among themselves and their environment, forming an intricate unit called an ecosystem.

3. Environmental factors are limiting on the number of organisms living within their influence, thus each environment has a carrying capacity.

4. An adequate supply of pure water is essential to life.

5. An adequate supply of clean air is essential to life.

6. Natural resources are not equally distributed over the earth or over time, and greatly affect the geographic conditions and quality of life.

7. Factors such as facilitating transportation, economic conditions, population growth, and increased leisure time have a great influence on changes in land use and centers of population density.

8. Cultural, economic, social, and political factors determine the status of man's values and attitudes toward his environment.

9. Man has the ability to manage, manipulate, and change his environment.

10. Short-term economic gains may produce long-term environmental losses.

11. Individual acts, duplicated or compounded, produce significant environmental alterations over time.

12. Private ownership must be regarded as a stewardship and should not encroach upon or violate the right of others.

Conception-Mendel (1974) concludes that the conceptual framework for environmental education should include these themes:

1. Living things are interdependent with one another and with their environment.

2. Organisms (or populations of organisms) are the product of their heredity and environment.

3. Organisms and environments are in constant change.

4. When matter changes from one form to another the amount of matter remains unchanged.

5. The economy of a region depends on the utilization of its resources and technology.

Stapp (1974) identified concepts to produce an environmentally literate, responsive, and responsible citizenry. The concepts fall into the following topical categories:

Closed system (5 concepts)
Biosphere (3 concepts)
Human populations (8 concepts)
Economics and technology (4 concepts)
Environmental decisions (5 concepts)
Environmental ethics (4 concepts)

Concluding this section are two sets of concepts produced by the International Environmental Education Workshop held in Belgrade, Yugoslavia (1975) and Subcommittee on Environmental Education, Federal Interagency Committee on Education (1976). These lists were developed by interdisciplinary "blue ribbon" panels at the international (UNESCO) and the national (USA) level. Basic concepts (fundamentals) were set forth to assist in achieving the goals established for environmental education.

The International Environmental Education Workshop (1975) proposed that the goal of environmental education is:

> the development of a world population that is aware of and concerned about the environment and its associated problems, and which has the knowledge, skills, attitudes, motivation, and commitment to work individually and collectively toward the solution of current problems and the prevention of new ones. (Belgrade Charter)

To meet this goal, the following basic concepts were recommended to serve as the building blocks on which the member states of the

United Nations could construct individual national environmental education programs.

1. The earth's environment is made up of physical components - air, water and solid materials - which constitute a complex and totally interrelated life support system called the 'ecosphere.' The ecosphere is composed of interacting systems called 'ecosystems' in which organisms, living things, interact with physical components. All living things are interdependent with one another, and with their physical environment.
2. Materials are continuously cycling and recycling in and among ecosystems. Energy, on the other hand, moves through ecosystems - some available energy is dissipated with each conversion, until all available energy is gone. These two factors illustrate why pollution control (preventing pollutants from entering natural cycles) and energy conservation are of fundamental importance in environmental education.
3. Each ecosystem has an ability, called 'carrying capacity', to support given numbers of each species within it. Population figures fluctuate from time to time, depending on variations in the components of the system, but remain relatively stable unless the system is altered in some significant way.
4. Humans are an integral part of earth's ecosystems, and are dependent on these systems for their life support. Humans are more capable of altering ecosystems - changing the way they operate - than any other species. The pollution that

humans can produce may harm human health and reduce the ability of ecosystems to support life. Human settlements and their development of resources can destroy habitats of other species. Humans are unique in the rapidity and magnitude of the changes they can make in their environment. These changes can be global, are often immediate, and may be irreversible. Human technology can be used either to the detriment or the enhancement of earth's ecosystems.

5. The unique human intellectual capacity to reason, experiment, understand, remember and communicate, produces a moral and ethical responsibility to bring human activities into balance with ecosystem processes. Human survival requires harmonizing man's activities with global ecosystems. Unless man can mold his policies and actions to conform with ecosystem processes, he may sacrifice his existence as a species.

The Subcommittee on Environmental Education, Federal Interagency Committee on Education (FICE-1976) set forth a framework of fundamentals about the Earth's Environment. These fundamentals are intended to help individuals and groups understand environmental issues; develop realistic environmental, social, and economic goals; set priorities for reaching those goals; and make rational decisions about environmental issues. The fundamentals are ecology based and designed to "serve as a basis from which can emanate a wide variety of materials, activities and programs."

Fundamental About the Earth's Environment

1. The Earth's environment is a whole.

2. The ecosphere is a dynamic, constantly changing macrosystem - a mosaic of ecosystems.

3. The energy and materials necessary for all life are components of each ecosystem.

4. Each ecosystem includes a number of species populations.

Fundamentals Concerning Humans as Ecosystem Components

1. Humans make use of ecosystems to satisfy basic needs and desires.

2. Humans affect ecosystems.

3. Ecosystems affect humans.

4. Complex interactions among humans and other ecosystem components occur continuously.

5. Humans are accountable for their effects on ecosystems.

Studies dealing with the organization (structure) of environmental education concepts

Environmental education in 1970 was an amorphous area of study in search of an identity. Schoenfeld (1970) noted, "There is no clearly defined and delineated structure to this area called environmental education." Tanner (1974) states "environmental education has no apparent boundaries. Therefore, it is considered to be everything to everyone, and by being everything it is in danger of becoming nothing." Educators and researchers flooded the literature with position papers, models, research studies, conceptual frameworks, and course descriptions in an effort to describe the domain of environmental education and attempt to answer the question, "What is environmental education?" This question has been answered to the satisfaction of most by the significant contributions to the development of an overall structure for the area of environmental education by the Stockholm Conference (1972), the International Environmental Education Workshop (Belgrade-1975), the Tbilisi Conference (1977), the Subcommittee on Environmental Education of the Federal Interagency Committee on Education (1976), and the research of Balzer (1971) and Harvey (1976).

A major concern of this study is not the structure of environmental education but the structure (domain) underlying a specific set of concepts as developed by Roth (1969). Roth classified the 111 concepts produced in his study into 13 categories and suggested that the topical organization used represents a more useful and appropriate structure of concepts than those existing in many school curricula and educational materials (Roth and Helgeson, 1972).

Historically, concepts have been organized by using the topical area, conceptual system, or presence of common words or ideas as criteria. No evidence was found that any research studies attempted to empirically investigate the underlying structure of a set of concepts.

Bowman (1972) proposed that environmental concepts could be placed in four major areas defined in the conceptual design: bio-physical, socio-cultural, change and dynamics, and environmental management alternatives. Roth's (1969) list of 111 con-epts that met the criterion of "acceptable" for environmental management education were submitted to a panel of seventeen experts comprised of Ohio State University professors representing the following disciplines: Science Education, Mathematics, Social Studies, Resource Development, Administration, Civil Engineering, Curriculum and Instruction, Elementary Education, Educational Administration, Conservation, Music, Environmental Education, Photography and Cinema, and Geography. The panel was asked to: (1) place the concepts into one of the four major areas and/or label any concept(s) that could not be appropriately placed in one of those areas; and, (2) choose the five concepts from each of the four areas believed to be the most important to man.

Based on the consensus reached by the panel of experts, Bowman concluded that the concepts identified by Roth (1969) could be categorized into the major areas:

1. biophysical environment
2. socio-cultural environment
3. change and dynamics
4. environmental management

Roth (1973) offered a model (Figure 1) "as a focus for further discussion and exploration, as a guide in the development of environmental education curricula, and as an organizer for continued research."

The conceptual schemes for each of the four areas are as follows:

1. Biophysical - Living things are interdependent with one another and their environment.
2. Socio-cultural - The relationships between man and the environment are mediated by culture.
3. Environmental Management - The management of resources to meet the needs of successive generations demands long range planning.
4. Change - Organisms and environments are in constant change.

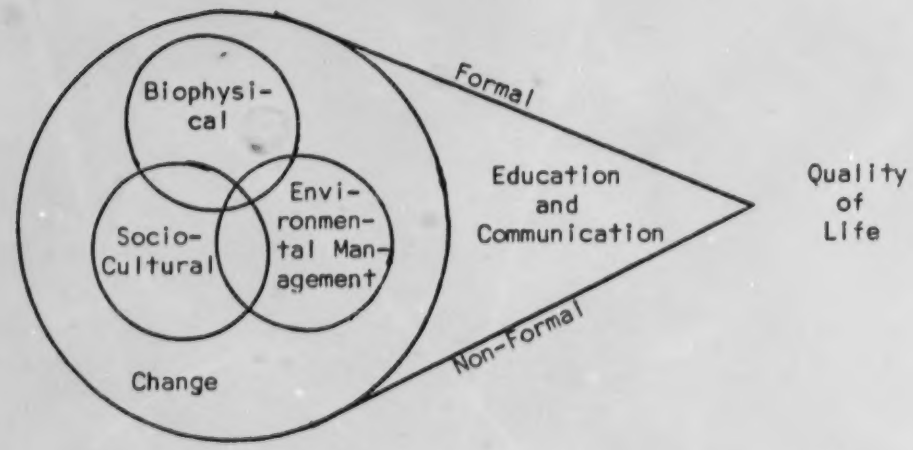


Figure 1. Roth (1973)

The conceptual areas (schemes) identified by Bowman (1972) and the model created by Roth (1973) are points of interest that provide a basis for comparison with the results of this study.

Q-Sort Techniques

Q-Sort Technique and Environmental Education

Brooks (1970) described the Q-sort technique as a procedure involving the selection of something that is directly related to a concept or theory under investigation. The something that is given to persons to select from may be words, phrases, pictures, or objects. If verbal expressions are used, they are placed one to a card, shuffled, and given to an individual with instructions to sort them into piles according to the extent of agreement or disagreement with the statements. Brooks states, "This sorting provides a conceptual representation of the sorters attitude toward the subject being considered - 'what is in his/her head'." The Q-sort technique has the advantage of permitting the subject to use his/her own frame of reference.

A general review of the literature related to environmental education revealed three studies that used Q-sort techniques as a research tool. Hanselman (1963) used the Q-sort technique to elicit opinions as to what conservation concepts and concerns should be included in conservation education at the university level. Bowman (1972) used the Q-sort technique to ascertain the relative importance and placement of concepts from Roth's taxonomy of concepts for environmental management education. Using Q-sort procedures to rank-order goal statements, Johnson (1977) investigated the relationship among environmental education, conservation education, outdoor education, ecological education, and environmentalized education.

No studies were found in which Q-methodology was used as the basis to formulate a research study on concepts. However, this methodology has found some use with the realm of environmental attitude assessment: Hoover and Schultz (1963) analyzed attitudes toward conservation education; Horn (1969) investigated attitudes toward the term, outdoor education; Steiner (1972) and Moyer (1977) developed instruments to measure environmental attitudes; and Doran (1980) assessed the environmental awareness of YCC campers.

Structured Versus Unstructured Q-sorts

The use of the Q-sort technique in research studies involves putting together a set of cards to form a Q-set. The Q-sets are either structured or unstructured. Wittenborn (1961) and Kerlinger (1973) reported that the great majority of Q-set studies used unstructured Q-sets.

"An unstructured Q-set is a set of items assembled without specific regard to the variables or factors underlying the items" (Kerlinger, 1973). An unstructured Q-set set is developed by gathering or writing homogeneous items believed to represent one broad variable. Being representative of this one broad area is the only criterion for selection.

When items are created to correspond to a particular theory or set of hypotheses, they are collectively known as a structured Q-set (Brooks, 1970). Stephenson (1967) expounded the use of structured Q-sorting to build and test theory. He concludes, "The derivation of Q-statements from some theoretical framework builds theory into the research tool and better tests theory in operational terms. Since the

instrument is constructed to embody the theory, the sorting of items by known types of individuals can test the hypotheses generated by the theory. Olson and Gravitt (1968) also argue the superiority of the structured Q-sort. They propose that statements used in unstructured Q-sets are generally selected without much concern for how they represent the population being studied or how relevant they are theoretically. Therefore, research studies using unstructured Q-sets are of less value because they have no theoretical base and theories continue to remain untested.

Recommended minimum and maximum limits for the number of items on a Q-set abound in the literature. Kerlinger (1973) argues that the key factors to consider are stability and reliability and suggests a number not less than 50 and, in most cases, no more than 100. A good range is 60-90 cards. Brooks (1970) agrees that the key concerns are statistical stability and reliability and proposes the number should be neither less than 50 nor more than 100. Schlinger (1969) supports the statistical stability and reliability arguments and considers 55-75 items to be ideal. She concludes that more than 75 items overwhelms respondents.

Forced versus Unforced Sorting

The forced sort procedure requires the subject to place a predetermined number of cards in each pile. Thus the researcher specifies the shape and scatter of the distribution curve.

Brooks (1970) offers the following example of the forced sorting procedure. Given sixty items describing a person, the person is asked to sort the cards along a rank order continuum from "Most like me" to

"Least like me", with varying degrees between the extremes. This is illustrated below. The numbers signify the number of cards per pile.

Most like me			n=60			Least like me		
2	3	6	11	16	11	6	3	2

Figure 2. FORCED SORTING-NORMAL DISTRIBUTION ILLUSTRATION

The center pile with 16 cards is neutral. They may have been ambiguous to the sorter or may have been left over after other choices were made. Brooks (1970) offers the distributions used in research by Block (1961), Knapp (1963) and Goldberg (1963).

The unforced sort method allows the Q-sorter to place each item into the pile in which he/she believes it to belong, regardless of the number of items already in the pile. The Q-sorter is also permitted to use any number of categories. The sorter, in effect, is free to make a spontaneous arrangement of items and the final distribution may have any shape and scatter.

The most common argument against forced sorting is that such sorting discards possibly important information in terms of elevation, scatter, and skewness (Brown, 1971). Cronbach and Glesser (1954) also support the argument:

> This forcing is of dubious value. It does insure variance in the responses and eliminates response sets. However, it discards possibly important information about differences in scatter, and gives data to which analysis of variance cannot properly be applied.

Gaito (1962) and Jones (1956) voiced the same criticisms against forced sorting.

Kerlinger (1972) recognizes the previously mentioned criticism but argues for the forced distribution:

> Because all subjects do not naturally sort the cards into a normal distribution or quasi-normal distribution does not mean that forced distributions should not be used. There are several reasons why subjects do not sort normally: the sample of items, and so on. Furthermore, the distribution of traits may be normal, but the subjects may of course not perceive the distribution themselves.

Stephenson (1953) and Block (1961) have also written in favor of the forced choice method.

Studies have been undertaken to compare the forced and unforced procedure. Block (1961) required judges to freely sort a set of items and then asked them to do a forced sort on the same items. When the unforced sorts were correlated with the forced sorts, the mean for the 55 correlations was found to be 0.94 and only two correlations fell below 0.90. Hess and Hink (1959), after an investigation of the two procedures, concluded that forced and unforced sorts do not provide strikingly different results.

Brown (1971) developed eleven different Q-sort distributions (skewed right, skewed left, normal, rectangular, etc.) and compared the possible correlations of the results. He concluded that the distribution does not noticeably effect correlation coefficients or factor loadings of the correlation coefficients when factor analysis is used as an extended analysis of data.

Brooks (1970) rebutes the major criticism of researchers with regard to forced sorting: statistically, the forced sort violates the assumption of independence. That is, the opportunity for a card to be placed in any pile is reduced each time another card is assigned to the

pile or the response to one item is affected by responses to other items. At least four rebuttals can be made to this criticism:

> (1) all forced choice procedures violate the assumption of independence, thus making Q sorting no different from other commonly used instruments in the behavioral sciences; (2) when a Q sort is properly administered, subjects understand that they are free to take any item from the pile into which it has been sorted and place it in any other pile; (3) the violation is so minute that it is doubtful that too much is risked in Q-statistical situations, if there is a fairly large number of items; (4) the requirement for statistical significance in Q sorts may be raised from the .05 level to the .01 level.

Brooks (1970) and Kerlinger (1973) also reject the criticism that the forced sort constrains the subjects and they do not like to do the sorting. Both report opposite results from subjects with whom they have worked. Livson and Nichols (1956) argue that, based on their evidence, "in most Q-sort applications, a prescribed forced distribution should be used."

Brooks (1970) argues that the forced Q-sort yields manageable data which is more easily analyzed. Olson and Gravatt (1968), after comparing forced versus unforced Q-sorting concluded that little information was either lost or gained as a result of either method.

Validity and Reliability of Q-Sorts

The validity of Q-sorts has not been extensively investigated. Mowrer (1953) and Block (1961) propose the Q-sort has a face validity if the empirical relationships that emerge are coherent with the theoretical framework that prompted the search. Cataldo (1970) states that when there is no proven external measure; face or content validity is the best judgement that can be made.

Reliability is usually demonstrated by a high correlation between results obtained on two or more performances with an instrument. The method of determining reliability most frequently used is the test-retest method. Using this method, and Pearson's r, Frank (1956) found the reliability to be high, with correlation coefficients ranging from 0.93 to 0.97. Hess and Hink (1959), using test-retest and Pearson's r, reported reliabilities as high as 0.99. Olson and Gravatt (1968), using test-retest, Pearson's r, and a two-week interval between the two administrations of the Q-sort, obtained an average correlation of 0.80. Gabel (1976), using the same method and a two-eight week interval between Q-sorts obtained an average correlation of 0.53.

Sampling

Kerlinger (1973), Brooks (1970), and Stephenson (1953) concluded that large sample or cross-sectional studies are not well suited for the use of the Q-sort technique. The major concern is that all parties or groups are represented. Schlinger (1969) proposed the structured sample design with random sampling of the population universe. Guilford (1974) suggested that stable correlations of data can be obtained if the number of respondents is approximately three times the number of items on the instrument.

Analyzing Q-sort Data

After data collection, the researcher must consider how the data will be analyzed. Numerical values are assigned to the series of cards and the statistical analyses are performed on these assigned values.

For example, in the figure below, the numbers above the line are the number of cards per pile, while the numbers below the line are those assigned for computational purposes.

2	3	6	11	16	11	6	3	2
+4	+3	+2	+1	0	-1	-2	-3	-4

n=60

FIGURE 3. FORCED SORT NORMAL DISTRIBUTION EXAMPLE WITH ASSIGNED VALUES

Brown (1970) analyzed existing literature and found that correlation, factor analysis, analysis of variance, chi-square, item analysis, and percentage and frequency counts have all been used in the analyses of Q-sort data. An examination of Q-sort literature by Wittenborn (1961) revealed that most of the analyses have been correlational in nature. Kerlinger (1972) believes that the amenability of Q-data to correlational analyses is one of its prominent, technical strengths.

Advances in computer technology and the advent of "canned" programs (SPSS, SAS, BMD) have led to increasing use of factor analysis as a tool of the researcher in his endeavor to discover relationships in data. Factor analysis enables the researcher to reduce the number of variables to those few which appear most responsible or most active in the process being studied. Brooks (1970) proposed that once the factors are discovered through factor analysis, the difference between groups may be evaluated parametrically; when the assumptions are met, by the _t_ test or the _F_ test.

Although not used as often as other methods, analysis of variance has been used in analysis of Q-sort data. Kerlinger (1972) cautions, "use analysis of variance as though it is all right to do so, but be especially careful in the conslusions and generalizations drawn from the analyses." This caution is offered because of (1) forced normalcy of the distribution due to forced sorting procedures and (2) the loss of independence of a Q-sort's items, due to separate item placement in a pile. Brown (1970), after a review of Stephenson's papers, observes that not once did Stephenson use analysis of variance as the preferred analytic method. That fact, Brown concludes, is a form of warning that analysis of variance should not be given analytic prominence.

Once factor analysis of the Q-sort data is completed, factor arrays can be developed. Kerlinger (1972) details the development of a factor array in the following manner: "One uses weighted averages of the responses of the individuals substantially loaded on a factor to determine the items most associated with a factor. Using the R point of view, the result is the identification of particular items which substantially load on a factor or factors."

Summary

A review of the literature was conducted to provide information on the methods and techniques used in the selection of concepts, the development of concept lists, and the collection and analysis of data relevant to those concepts. Information was also sought on the considerations involved in conducting research within the conceptual realm. The review of the literature has indicated the following:

1. No universal or widely accepted definition or use of the term "concept" exists. The term "concept" means many things to many people. Terms that have been used synonomously with concept include: conceptual scheme, major concept, principle, fundamental idea, theme, major principle and generalization. The researcher is forced to select from a variety of definitions and uses and apply that which best fits the nature and needs of the study.
2. Extensive lists of concepts have been formulated varying in length from 477 (Visher, 1960) to three (Brennan, 1969). Sources of concepts included: textbooks, journals, reference books, curriculum materials, master's theses, doctoral dissertations, and searches of the ERIC data base.
3. Once developed, lists of concepts are usually validated by one or more judges or jury panels. These vary in size from a maximum of 350 (Roth, 1969) to a minimum of 5 (Allman, 1972). Validation of a list of concepts by a national panel in a research study in higher education has not occurred since 1972.
4. Subjects in research studies involving concept identification and validation have been selected largely from the realm of higher education. Efforts have been made to use inter-disciplinary jury panels, but these have been stacked in favor of higher education. Few studies have involved the private or public school classroom teacher. Input into research studies from the public sector or the environmental practitioner is non-existent.

5. Historically, concepts have been organized by using the topical area, conceptual system, or presence of common words or ideas. The most commonly used organizational scheme appears to be the four categories (biophysical, socio-cultural, management, and change) developed by Bowman (1972) from Roth's study (1969). Empirical investigations into the underlying structure of a set of concepts or peoples' perceptions of that structure are lacking in the literature.
6. The Q-sort technique is a method of eliciting responses that has found very limited use in environmental education research. No evidence that Q-methodology has been used in any form in environmental education research was uncovered. The use of Q-methodology and Q-sort techniques in the areas of psychology, the social sciences, and education; and, recent advances in the development of computer programs to handle the complex statistics associated with this technique suggest its applicability to research in environmental education.

Chapter III

Methods and Procedures

Introduction

This chapter describes the methods and procedures used in this study to develop the instrumentation, to collect the data, and to analyze the data. The organization of this chapter follows the same order in which the study was conducted. It was necessary to first identify and validate a set of environmental concepts. It was decided that a structured Q-set and a biographical questionnaire would be the best means of collecting data given the hypotheses to be tested. The sample of persons was drawn and the data were collected. Another separate sample of persons, representative of the study sample was developed. This sample of persons was used in a test-retest setting to obtain data which could be used to determine reliability coefficients for the stability of the Environmental Concepts Q-set (ECQ). The data from the study were coded, punched on computer cards, and computer analyzed.

Development of the Environmental Concept Q-set

The initial task was perceived as the development of a set of concepts that would be representative of the domain of environmental education. This set of concepts would then serve as the basis for a statistical investigation into the underlying structure of the set of concepts.

An extensive review of pertinent instructional materials and resources was conducted to identify a tentative list of concepts. Materials and resources reviewed included: (1) the data base of the Educational Resources Information Center (ERIC) at the ERIC Clearinghouse on Science, Mathematics and Environmental Education at The Ohio State University; (2) environmental and science education journals such as: the Journal of Environmental Education and the Journal of Research in Science Teaching, (3) curriculum materials such as Project I-C-E and Project Learning Tree; (4) high school and college textbooks; and (5) dissertations found through Dissertation Abstracts.

The review of literature revealed that many lists of concepts already existed. It was decided to utilize an existing list of concepts for this study and the decision was made to use the concept list developed by Roth's (1969) study (Appendix A). Roth's list was chosen for the following reasons:

1. the interdisciplinary nature of the list and the representativeness of the concepts to the domain of environmental education lends itself to the investigation of the hypotheses formulated for this study;
2. the extensive validation procedures and the quality of the review and national panel ensures an exemplary product; and,
3. the wide usage the list has achieved since its inception in the development of instructional programs (K-16) (Force, 1978).

Roth's (1969) list also provided additional interest for this study in that Bowman (1972), concluded that Roth's list could be

organized into four conceptual categories: biophysical environment; socio-cultural environment; change and dynamics; and environmental management.

Q-sorting is a more time consuming method of data collection than are some other commonly used methods. Therefore the number of items to be used in the Q-sort procedure becomes important. Schlinger (1969), Brooks (1970), and Kerlinger (1973) recommend minimum and maximum limits ranging from 50 to 100 items. Concern over respondent overload and the probable lower Q-set return response rate from subjects in the study resulting from that overload culminated in a decision to reduce the number of concepts from the original 111 in Roth's study to a more workable number for this study. Also contributing to this decision was the overall length of some of the concepts in Roth's original list.

This reduction process was accomplished through the use of an interdisciplinary panel comprised of members of the Advisory Committee to the School of Natural Resources, The Ohio State University (N=10 respondents) and the Alumni-Industry-Agency Advisory Committee of the Division of Environmental Education, School of Natural Resources, The Ohio State University (N=8 respondents).

Each member was sent the complete list of concepts; asked to review each concept statement; and, identify the 25 most important and 25 least important concepts. This procedure produced the data necessary to develop a quasi-normal distribution of concept values that could be used to reduce the concept list to a more manageable number. The Information Sheet developed to obtain background information on selected variables was piloted as this time. It was decided to use a Q-set with

a rectangular distribution in this study. That is, 54 concepts would be sorted into nine (9) piles of six (6) cards each. Using the data provided by the interdisciplinary panel, a set of 54 concepts was identified for validation.

Validation

The refined list of 54 concepts and the Information Sheet were then sent to 15 randomly selected members of the 32 member Board of Directors of the Alliance for Environmental Education for review as to the accuracy of the concept statements and their validity as fundamental concepts on which to base a general program of environmental education. This process of validation by panel review, juries, judges, and/or "experts in the field" is well established and documented in the literature of environmental education.

This validated set of 54 concept statements professionally printed on the back of computer cards, along with the Information Sheet, became the instrument for this study (Appendix B). The concepts were randomly assigned numbers for identification purposes. The compilation of 54 concept statements developed for this study is known as the Environmental Concept Q-sort (ECQ).

Development of the Sorting Instructions

The sorting instructions for the ECQ (Appendix D) were developed by Gabel (1976) and modified to meet the needs of this study. Gabel notes that the reading level of these instructions is below the eighth grade level. The sorting instructions were piloted with eight graduate students in science and environmental education at The Ohio State

University. No sorting errors occurred and an average time of 26 minutes was required to complete the Q-sort.

The instructions requested the subjects to sort the Q-statements of the ECQ into a rectangular distribution of nine (9) piles with six (6) cards per pile. That is, the subjects were asked to sort the Q-statements using a forced sort technique. This technique requires the individual to place the Q-statements in a predetermined number of piles. Each pile must contain a predetermined number of cards. The specification of the number of piles and the number of cards per pile controls the shape of the distribution curve.

Support from the literature for the use of the forced sort comes from Stephenson (1953), Brooks (1970) and Kerlinger (1973). Brooks (1970) and Hess and Hink (1959) cited research studies which indicated that the forced sort does not provide significantly different results from not forced sorts on the same Q-sets. Hess and Hink (1959), Brooks (1970), and Brown (1971) concluded that the forced distribution resulting from a forced sort does not greatly influence the results of the analysis of the data.

The individuals sorting the Q-statements were asked to do so in terms of the importance they assigned to the concept. It was suggested that sorters keep the following question in mind: "What should a student know about the environment?"

Development of the Information Sheet

The Information Sheet (Appendix C) was developed to collect data for the purpose of testing hypotheses 1 and 3. Each subject was requested to provide information from the following areas:

1. age;
2. gender;
3. amount of education;
4. automobile(s) owned;
5. housing;
6. television viewing patterns;
7. publications read;
8. community involvement; and
9. population of county of residence.

The Information Sheet was piloted twice during the development and validation of the ECQ. Based upon the reaction of the respondents and the data provided, the Information Sheet was revised to:

1. provide a more representative list of publications read. Based on the negative responses to the pilots, the publications Environment and Natural History were deleted and replaced with National Geographic and Field and Stream;
2. ensure that it could be easily completed; and
3. ensure that the necessary information would be secured from each person.

Development of the Population Sample

This study focuses on two groups of individuals involved with environmental education:

1. representatives of colleges and universities involved in teaching, research or extension work (university group); and,
2. representatives of environmental organizations that either by their goals or actions have indicated or expressed a concern for or an interest in the environment or environmental education (environmental organization group).

University Group

The University group (N=100) was randomly selected from a pool of names compiled from three sources:

1. readers of the Journal of Environmental Education;
2. the list of participants in the 1978 and 1979 National Conference of the National Association for Environmental Education (NAEE); and,
3. contributors to Current Issues in Environmental Education, Volumes I-V, (1975-1979) from colleges and universities.

The geographic distribution of the sample was determined using the procedures outlined by Schlessinger et al. (1973) in A Survey of Science Teaching in the Public Schools of the United States - 1971 (Appendix H). Names from population pools were assigned to the appropriate geographic region and then randomly drawn to complete the study sample. The sample was stratified by geographic region and general population.

Based on these procedures, the following sampling distribution was obtained:

REGION	NAME	SAMPLE SIZE UNIVERSITY	ORGANIZATION
1	New England	6	5
2	Mideast	21	40
3	Great Lakes	20	7
4	Southeast	22	18
5	Plains	8	8
6	Rocky Mountains	2	5
7	Southwest	8	3
8	Farwest*	13	14
		N=100	N=100

* includes Alaska and Hawaii

TABLE 1. DISTRIBUTION OF UNIVERSITY AND ORGANIZATION SAMPLES BY GEOGRAPHIC REGION

Environmental Organization Group

The environmental organization group (N=100) was randomly selected from a pool of names compiled from two sources:

1. the Conservation Directory - 1979 of the National Wildlife Federation; and,
2. the United States Government Manual (1979-1980).

The environmental organization group was limited to those associations that were interstate, national, or international in scope with headquarters located within the continental United States. It was decided to send the ECQ to the public education or public information officer of the organization. If no such position existed, the ECQ

was sent to the highest ranked officer listed within the organization.

Because of the massive concentrations of environmental organization headquarters around the metropolitan areas of New York City, Washington, D.C., Los Angeles, and San Francisco, it was impossible to develop a stratified random sample for this group by geographic region. A random sample was selected from the pool of environmental organizations that had been compiled.

Data Collection

Prior to the collection of data, The Ohio State University Human Subjects Review Committee was requested to waive the requirement that each subject selected for the study complete a consent form. Permission to waive the use of the consent form in this study was granted (Appendix E).

Packets of materials were prepared for the 200 individuals in the sample. The materials in each packet included:

1. a form letter on Division of Environmental Education stationery signed by Dr. Robert E. Roth and the researcher. The heading and salutation were personalized;
2. the Information Sheet;
3. the Instructions for Using the Computer Cards and Small Envelopes;
4. the Environmental Concept Q-set (ECQ);
5. Nine (9) small envelopes marked +4 Most Important +3, ... -3, -4 Least Important;
6. A stamped and addressed 6" x 9" reinforced envelope for returning the responses.

For the university group, the Information Sheet was printed on yellow paper and the computer cards of the ECQ had no distinguishing marks. For the environmental organization group, the Information Sheet was printed on pink paper and the computer cards had a pink stripe running along the top of the card.

The materials were mailed to all subjects using the Ohio State University Station of the United States Postal Service. A record was kept of the date the response was received by the investigator. Weekly summaries were prepared and the data were grouped for each group (Figure 4).

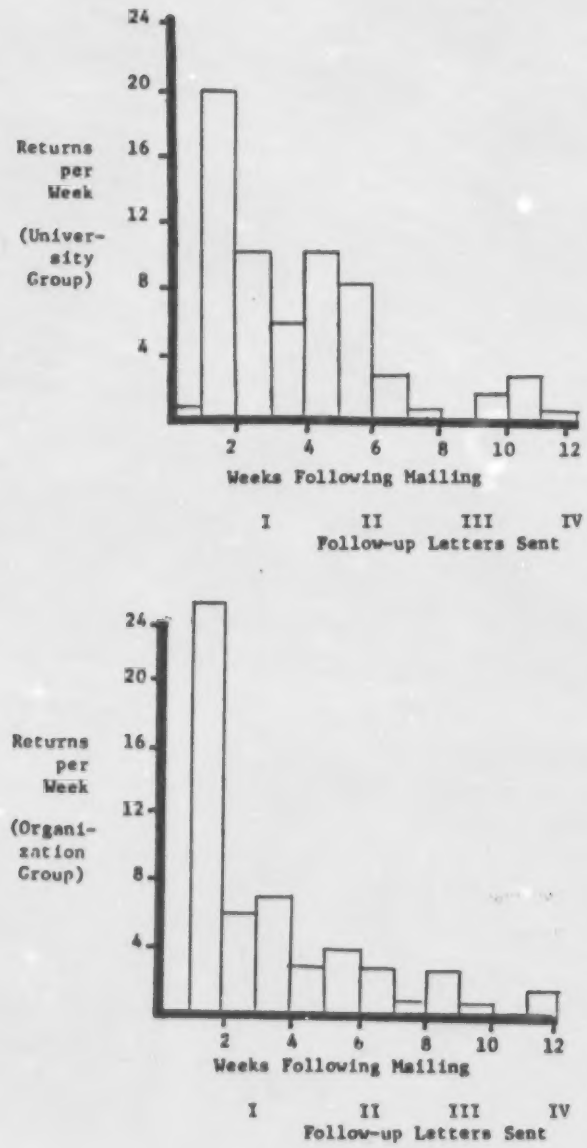


Figure 4 : Total Number of Returns Each Week by Study Group

TABLE 2

Procedures Used To Increase The Response Rate And The Number Of Returns For Each Followup Letter (FLLWUPS)

Followup Number	Followup Action	GROUP			
		University		Organization	
		f	%	f	%
0	None: Subject responded to Initial Mailing	36	55.4	37	67.3
1	Formal letter and map showing the subject as a non-respondent	21	32.2	8	14.5
2	Formal letter with "respond by date" blocked in and map showing the subject as a non-respondent	2	3.1	6	10.9
3	Formal letter with "respond by date" blocked in, a map showing the subject as a non-respondent, and a cartoon (Appendix I)	6	9.2	4	7.3

Attempts to Increase Response Rate

Four follow-ups were conducted as part of this study in the effort to attain the highest possible response rate.

Followup I -Subject sent formal letter again requesting participation in the study.

-Map of the United States on the back side of the letter showed the subject as a non-respondent in a national study.

Followup II -Same as Followup I with this addition: the "please respond by date" in the letter was blocked in. For example [June 15, 1980]

Followup III -Same as Followup II, with the addition of a cartoon. (Appendix I)

Followup IV -Letter requesting that the subject at least fill out the Information Sheet and return it.

Results for this phase of the study are presented in Table 2.

Analysis of Non-Respondent Data

After the twelfth week of the study, the data collection phase of the study was officially terminated. By this time, three followup attempts had been made to elicit subject participation. Each non-respondent was sent a fourth personal letter and the Information Sheet requesting that they take the time to complete the Information Sheet and write down any reasons they might have had for not participating in the study. It was hoped that any information collected about the non-respondents might prove useful in future studies. Completed Information Sheets were returned by eighteen (18) individuals - nine (9) from each study group.

The main reasons given for not responding were "too busy", "not interested", or "all the concepts were equally important and I couldn't

make a decision."

The data collected provided little insight as to what characterized a non-respondent with one exception: of the eighteen (18) non-respondents returning Information Sheets, the highest degree attained by fourteen (14) of those responding was in the social political or administrative sciences category. None of the non-respondents had degrees in the biological or physical sciences.

Reliability of the ECQ

The test-retest method has been most frequently used to determine the reliability of the Q-sort technique with a given Q-test. The statistical analysis has been the calculation of the coefficient of correlation of each Q-statement with itself using Pearson's r (Chapter 2, page 42).

The test-retest method was used to determine the reliability of the ECQ in this study. A range of four (4) to twelve (12) weeks passed between the first and second sorting of the ECQ. Pearson's r was used to calculate the correlation of each Q-statement with itself. Two samples (N=5) for the reliability determination were randomly drawn from each group. The coefficients of correlation (Pearson's r) for each ECQ statement are presented in Table 3.

The average of the coefficients of correlation was 0.57. The 25 conceptual statements that are the components of the five factor solutions presented in Chapter IV and have an average coefficient of test-retest correlation of 0.62.

TABLE 3

Coefficients of Correlation (Pearson's r) for ECQ

Statements Calculated Using the Test - Retest Method

Statement Number	r	p	Statement Number	r	p
1	.84	.004	28*	.89	.001
2	.40	.166	29*	.75	.017
3*	.77	.013	30*	.23	.289
4	.55	.079	31	.36	.189
5	.67	.035	32	.08	.423
6	.33	.211	33	.59	.061
7*	.55	.080	34*	.23	.289
8	.63	.048	35	.44	.135
9	.81	.007	36*	.65	.041
10	.84	.005	37*	.33	.211
11*	.35	.196	38	.80	.009
12*	.69	.028	39	.63	.047
13	.61	.054	40	.62	.049
14	.39	.163	41*	.87	.002
15*	.50	.105	42*	.77	.013
16	.58	.066	43	.88	.002
17	.93	.000	44*	.68	.033
18*	.77	.013	45	.06	.445
19*	.79	.010	46	.28	.249
20*	.97	.000	47	.44	.138
21	.53	.086	48*	.52	.093
22	.84	.005	49*	.23	.289
23*	.92	.001	50*	.64	.042
24	.13	.377	51*	.63	.047
25	.10	.411	52	.55	.080
26*	.63	.047	53*	.84	.005
27	.52	.092	54	.25	.273

*Components of the five (5) FACTOR Solution

Mean (Pearson's r's) = 0.57

The Variables

The Variables used to test the hypotheses are presented in this section. They are presented in the order of appearance on the computer card set up. Information provided includes:

1. the number of the computer card;
2. the variable description;
3. the variable symbol;
4. variable value codes and labels.

Card	Columns	Variable Description	Variable Symbol	Value Codes and Labels
1	1	Card Number	CARDNUM	1-3
	2	Geographic Region	GEOGREG	1-8
	3	Group Membership	GROUP	1 = university 2 = organizations
	4-6	Subject ID	SUBJID	1-100
	7	Gender	SEX	1 = female 2 = male
	8	Age	AGE	1 = 18-26 4 = 45-53 2 = 27-35 5 = 53-62 3 = 36-44 6 = 62+
	9	Education	EDUCATION	1 = high school 2 = two year school 3 = bacheiors 4 = masters 5 = doctorate 6 = other
	10	College Education	CLLGEDN	1 = yes 0 = no
	11	Undergrad Major	UNDGMJR	1 = biological sciences 2 = communications 3 = earth sciences 4 = education 5 = health professions 6 = mathematics 7 = natural sciences 8 = physical sciences 9 = social, political administrative

Card	Columns	Variable Description	Variable Symbol	Value Codes and Labels
1	12	Graduate or professional major	GRADMJR	Same as 11
	13	Persons in household	PEOPLE	1-9
	14	Own Car	CARS	1 = yes 0 = no
	15	Number of cars	NMBRCARS	1-9
	16	Own or Rent Residence	HOUSING	1 = Own Home/Apartment 2 = Rent Home/Apartment
	17	Population of County of Residence	COUNTY	1 = Less than 35,000 2 = 35,000-150,000 3 = 150,000-1.5 million 4 = More than 1.5 million
	18	Hours of TV watched per week	TVHRS	1 = 0-4 hours 2 = 5-8 hours 3 = 9-12 hours 4 = 13-16 hours 5 = 17-20 hours 6 = More than 20 hours
	19	Watch Public Television Publications Read Regularly	PBS	1 = Never 2 = Occasionally 3 = Often
	20	Audubon	AUDUBON	1 = yes 0 = no
	21	Field & Stream	FIELDSTM	1 = yes 0 = no

Card	Columns	Variable Description	Variable Symbol	Value Codes and Labels
1	22	Newsweek	NEWSWEEK	1 = yes 0 = no
	23	Time	TIME	1 = yes 0 = no
	24	Smithsonian	SMITHSAN	1 = yes 0 = no
	25	National Geographic	NTLGEOG	1 = yes 0 = no
	26	U.S. News and World Report	USNEWSWR	1 = yes 0 = no
	27	Scientific American	SCIAMRCN	1 = yes 0 = no
	28	Wall Street Journal	WALLSTJL	1 = yes 0 = no
	29	Journal of Environmental Education	JRENVEDN	1 = yes 0 = no
	30-38	Current Involvement	CURINV 1 to CURINV 9	1 = yes 0 = no
	39	Type of Organization	ORGZNTYP	1 = Professional 2 = Non-Professional
	40	Organizational Concern	CONCERN	1 = Special Interest 2 = Public Service
	41-80	Concepts 1-20	CONCPT 01 to CONCPT 20	-4 to +4

Card	Columns	Variable Description	Variable Symbol	Value Codes and Labels
2	1	Card Number	CARDNUM	1-3
	2	Geographic Region	GEOGREG	1-8
	3	Group Membership	GROUP	1 = university 2 = organizations
	4-6	Subject ID	SUBJID	1-100
	7-74	Concepts 21-54	CONCPT 21 to CONCPT 54	-4 to +4
	75-77	Blank		
	78-79	Week Returned	WEEKRTND	1-12
	80	Followups	FLLWUPS	1-3
3	1	Card Number	CARDNUM	1-3
	2	Geographic Region	GEOGREG	1-8
	3	Group Membership	GROUP	1 = university 2 = organization
	4-6	Subject ID	SUBJID	1-100
	7-12	Factor Score For Factor 1	FACTOR 1	-1 to +1
	13-18	Factor Score For Factor 2	FACTOR 2	-1 to +1

Card	Columns	Variable Description	Variable Symbol	Value Codes and Labels
3	19-24	Factor Score For Factor 3	FACTOR 3	-1 to +1
	25-30	Factor Score For Factor 4	FACTOR 4	-1 to +1
	31-36	Factor Score For Factor 5	FACTOR 5	-1 to +1

[a]Blanks were coded for all variables to which the subject did not respond.

Organization of the Data

As previously stated, the 54 concept statements were professionally printed on the back of computer cards. The reasoning behind the use of computer cards is as follows: A source of potential error is introduced into the data analysis phase of a Q-sort when values are assigned to the sorted piles and these values are then transferred to coding sheets and punched onto computer cards. In an effort to reduce the number of potential errors and the time involved in the overall process, the use of computer cards and the following process were adopted:

1. the 54 concept statements were professionally printed on the back side of computer cards;
2. each concept was randomly assigned a two-digit number (01-54) which was punched onto the computer card in columns 1 and 2;
3. the cards with the 54 different concept statements printed on the back side were now assembled into the Environmental Concept Q-set (ECQ);
4. the group membership code (1 = university, 2 = environmental organization) and subject ID (001-100) were punched in column 3 and columns 4-6 respectively on every computer card in the ECQ. At this point, the ECQ was ready for mailing to the study groups;
5. on the return of the Q-set, the computer cards had been sorted into nine (9) piles of cards, six cards to a pile. The values assigned to the piles ranged from +4 (most

important) to -4 (least important);

6. as the concept number, group membership code, and subject ID had been previously punched on the cards, the cards from each pile were stored in a separate box until the number of returned Q-sets was sufficient enough to warrant batch punching;
7. the value assigned to the concept statement was gang-punched by key punch machine onto the computer cards in columns 7-8. That is, all cards receiving the value, (+4), were punched at the same time; all cards receiving the value (-4) were punched simultaneously and so on;
8. the concept statements with values punched in columns 7-8 were then sorted by subject ID back into the ECQ with the statements arranged by increasing concept number.

The data collection procedures for this study produced 55 computer cards per subject (54 concept statement cards and one card for the data provided by the Information Sheet). To reduce the number of cards needed in the data analysis phase of the study, a FORTRAN-Punch computer program (Appendix G) was written. This program consolidated the data and reduced the number of cards per subject from 55 to 2. A third computer card containing the factor scores generated for the testing of hyopthesis 2 was later added.

Analysis of the Data

Once the data had been transferred to punched cards and these cards were verified, the analysis of the data was begun.

The SPSS subprogram FREQUENCIES was used to determine the frequency and the percentage of responses on each value of each variable. This subprogram also computed the mean and standard deviation for each variable.

The SPSS subprogram PEARSON CORR was used to determine the reliability of the Q-sort technique by the test-retest method. The correlation coefficient of each statement with itself was calculated using Pearson's r.

The SPSS subprogram T-TEST was used to determine which concepts had significant group mean differences.

The BMD (1977) subprogram p4M (Factor Analysis) was used for the factor analysis of the responses to the Q-set concept statements. P4m performed a factor analysis of a correlation matrix. Initial factor extraction is by principal components. An orthogonal rotation (VARIMAX) was used. Standardized factor scores were computed for the factor solutions which were developed.

The BMD (1977) subprogram P1V (one-way Analysis of Variance) was used to test hypothesis 2. The factor scores, from each of the five (5) factors developed for the total sample, were treated individually as dependent variables. The test for significant differences was made by the variable, group membership (GROUP).

The BMP (1977) subprogram P2R (Stepwise Regression) was used to test hypothesis 3. The dependent variables were the five (5) factor scores from the factor solution of all respondents combined. The independent variables came from the Information Sheet. These included:

1. age;
2. gender;
3. amount of education;
4. automobile(s) owned;
5. housing
6. television viewing patterns;
7. publications read;
8. community involvement; and
9. population of county of residence.

Chapter IV

Analysis of the Data

Introduction

Presented in this chapter are the results of the data analysis. These results are presented in five sections. The first section presents the descriptive sratistics (frequencies, percentages, means, and standard deviations) for the variables generated from the Information Sheet. Section two presents the descriptive statistics for the ECQ data. Section three details the results of the factor analysis performed on the placement of the Q-statements. Included in this section is a comparison of the university and environmental organization groups in terms of the underlying dimensions (factors) of a set of environmental education concepts. Section four presents the regression analyses that were performed to test Hypothesis 2. Section five compares the underlying dimensions developed by this study to those used by Roth (1969) and proposed by Bowman (1972). A summary concludes the chapter.

Descriptive Statistics for the Information Sheet Data

The variables detailed in this section were produced from the Information Sheet. The analysis of the data was performed by the SPSS (Nie, et al., 1975) subprogram FREQUENCIES. A listing of the variables analyzed in this section, plus the variable descriptions, coded values, and value labels, is provided in Table 4.

In each study group, the percentage of males and females was the same: 80.0% male and 20.0% female (Table 5).

Table 5

Descriptive Statistics for Gender Respondents (SEX)

Variable (LABEL)	University		Organization	
	f (N=65)	%	f (N=55)	%
Gender (SEX)				
female	13	20.0	11	20.0
male	52	80.0	44	80.0
Total	65	100.0	55	100.0

Table 6 shows that the university group had the smaller mean age and standard deviation. For the organization group, 34.5% of those responding indicated they were 54 years old or older compared to 15.4% of the university group falling within this category. About 60.0% of the university sample were in the age range of 36-53 years as compared to 32.8% of the organization group.

TABLE 4

THE VARIABLES

VARIABLE SYMBOL	VARIABLE DESCRIPTION	CODED VALUE	VALUE LABEL
GROUP	Group Membership	1[a].	University
		2.	Environmental Organization
SEX	Gender of Respondent	1	Female
		2	Male
AGE	Age of Respondent	1	18-26 years
		2	27-35 years
		3	36-44 years
		4	45-53 years
		5	54-62 years
		6	63 years or above
EDUCATION	Level of Education of Respondent	1	High School
		2	Two year school
		3	Bachelor's
		4	Master's
		5	Doctorate
		6	Other (Please describe)
CLLGEDN	College Education	0	Did not have
		1	Did have
UNDGMJR	Undergraduate Major	1	Biological Sciences
		2	Communications
		3	Earth Sciences

TABLE 4 continued

VARIABLE SYMBOL	VARIABLE DESCRIPTION	CODED VALUE	VALUE LABEL
UNDGMJR	Undergraduate Major	4	Education
		5	Health Professions
		6	Mathematics
		7	Natural Sciences
		8	Physical Sciences
		9	Social, Political or Administrative Sciences
GRADMJR	Graduate Major	1	Biological Sciences
		2	Communications
		3	Earth Sciences
		4	Education
		5	Health Professions
		6	Mathematics
		7	Natural Sciences
		8	Physical Sciences
		9	Social, Political or Administrative Sciences
PEOPLE	Members of Household	1 to 9	
CARS	Car Ownership	0	Did not own
		1	Did own
NMBRCARS	Cars Owned or Leased	1 to 6	
HOUSING	Own or Rent	1	Own residence
		2	Rent residence

TABLE 4 continued

VARIABLE SYMBOL	VARIABLE DESCRIPTION	CODED VALUE	VALUE LABEL
COUNTY	Population of County of Residence	1	Less than 35,000
		2	35,000-150,000
		3	150,000-1.5 million
		4	More than 1.5 million
TV HRS	Hours of Television Watched per Week	1	0-4 hours
		2	5-8 hours
		3	9-12 hours
		4	13-16 hours
		5	17-20 hours
		6	More than 20 hours
PBS	Frequency of Watching Public Television	1	Never
		2	Occasionally
		3	Often
	Publications Read Regularly		
AUDUBON	Audubon	0	Did not read
		1	Did read
FIELDSTM	Field & Stream	0	Did not read
		1	Did read
NEWSWEEK	Newsweek	0	Did not read
		1	Did read
TIME	Time	0	Did not read
		1	Did read

TABLE 4 continued

VARIABLE SYMBOL	VARIABLE DESCRIPTION	CODED VALUE	VALUE MEAL
SMITHSAN	Smithsonian	0	Did not read
		1	Did read
NTLGEOG	National Geographic	0	Did not read
		1	Did read
	Publications Read Regularly (Cont.)		
USNEWSWR	U S News and World Report	0	Did not read
		1	Did read
SCIAMRCN	Scientific American	0	Did not read
		1	Did read
WALLSTJC	Wall Street Journal	0	Did not read
		1	Did read
JRENVEDN	Journal of Environmental Education	0	Did not read
		1	Did read
CURINV 1	Voted in an election	0	Did not
		1	Did
CURINV 2	Wrote to the editor of a magazine, newspaper, radio, or TV station	0	Did not
		1	Did
CURINV 3	Gave a speech or addressed a public meeting on an environmentally-related topic	0	Did not
		1	Did

TABLE 4 continued

VARIABLE SYMBOL	VARIABLE DESCRIPTION	CODED VALUE	VALUE LABEL
CURINV 4	Took active part in a civic or social issue	0 1	Did not Did
CURINV 5	Wrote to a Congressperson or other elected official about an environmental issue	0 1	Did not Did
CURINV 6	Wrote something for publication in a popular magazine or professional journal	0 1	Did not Did
CURINV 7	Alone, or in a group, visited representative(s) of an institution, government body, civic group or corporation to make known your point of view on an environmental issue.	0 1	Did not Did
CURINV 8	Joined or continued membership in an environmental or consumer group	0 1	Did not Did
CURINV 9	Made a contribution to or worked for an environmental or consumer group	0 1	Did not Did

[a]In addition to the variable values listed, blanks were coded for all variables to which the respondent did not respond

TABLE 6

DESCRIPTIVE STATISTICS FOR AGE OF RESPONDENTS (AGE)

	CODE	UNIVERSITY		ORGANIZATION	
		f	%	f	%
18-26 years	1	3	4.6	4	7.3
27-35 years	2	13	20.0	14	25.5
36-44 years	3	20	30.8	9	16.4
45-53 years	4	19	29.2	9	16.4
54-62 years	5	7	10.8	12	21.8
63 years or older	6	3	4.6	7	12.7
Mean		3.35		3.58	
SD		1.19		1.56	

Not unexpectedly, 81.5% of the university sample had attained the doctoral degree as compared to 32.7% of the organization sample. Those with Master's degrees as the highest attained degree in the university sample (16.9%) tended to be affiliated with colleges rather than universities. For the organization sample, 27.3% indicated they held Master's degrees and 29.1 indicated their highest degree attained was the Bachelor's degree. However, 9.1% of the organization sample had not gone beyond the high school level (Table 7).

TABLE 7

DESCRIPTIVE STATISTICS FOR HIGHEST LEVEL OF EDUCATION

	CODE	UNIVERSITY		ORGANIZATION	
		f	%	f	%
High School	1	0	0.0	5	9.1
Two Year School	2	0	0.0	0	0.0
Bachelors'	3	1	1.5	16	29.1
Masters'	4	11	16.9	15	27.3
Doctorate	5	53	81.5	18	32.7
Other	6	0	0.0	1	1.8
Mean	4.80			3.58	
SD	0.44			1.56	

Table 8 shows that the greatest number of respondents from both study groups majored in the biological sciences at the undergraduate level. For the university group, the next highest number of undergraduate majors were in the categories of communications (13.8%) and education (13.8%). The second highest-rated undergraduate major in the environmental organization sample was a grouping of the social, political and administrative sciences (28.[illegible]%).

For the university sample, 40.6% of the respondents indicated that they had graduate majors in education with graduate majors in the biological sciences running a distant second (21.8%). The greatest number of respondents in the organization sample indicated their graduate

major was in the biological sciences (39.5%) with social, political, and administrative sciences in second place (24.2%).

TABLE 8

DESCRIPTIVE STATISTICS FOR UNDERGRADUATE AND GRADUATE MAJORS

	UNIVERSITY				ORGANIZATION			
	UNDERGRADUATE		GRADUATE		UNDERGRADUATE		GRADUATE	
	f	%	f	%	f	%	f	%
Biological Sciences	24	36.9	14	21.8	18	36.0	13	39.5
Communications	9	13.8	5	7,8	6	12,0	1	3.0
Earth Sciences	2	3.1	5	7.8	1	2.0	0	0.0
Education	9	13.8	26	40.6	1	2.0	4	12.1
Health Professions	1	1.5	1	1.6	0	0,0	3	9.1
Mathematics	2	3.1	1	1,6	0	0,0	0	0.0
Natural Sciences	5	7.7	7	10.9	7	14,0	3	9.1
Physical Sciences	7	10.8	4	6.3	3	6,0	1	3.0
Social, Political or Administrative Sciences	6	9.2	1	1.6	14	28.0	8	24.2
TOTAL	65	100.0	64	100.0	50	100,0	33	100.0

Tables 9-12 describe certain demographic and lifestyle variables. The environmental organization group had the smaller mean and standard deviation for the variable - number of people living in the household (Table 9).

TABLE 9

Descriptive Statistics for Persons in Household (PEOPLE)

Variable (LABEL)	University f (N=65)	%	Organization f (N=55)	%
Persons in household (PEOPLE)				
1	9	13.8	6	10.9
2	16	24.6	20	36.4
3	13	20.0	10	18.2
4	16	24.6	12	21.8
5	8	12.3	5	9.1
6	0	0.0	2	3.6
7	2	3.1	0	0.0
8	0	0.0	0	0.0
more than 8	1	1.5	0	0.0
Total	65	100.0	55	100.0
Mean	3.19		2.93	
SD	1.61		1.32	

Organization group members watched slightly more regular television than their university counterparts, but both groups exhibited similar PBS television viewing patterns (Table 10). All respondents from the university sample owned or leased at least one car, but two members of the organization sample indicated they did not own/lease a car.

TABLE 10

Descriptive Statistics for the Variables; Hours of TV Watched per Week (TV HRS) and Watch Public Television (PBS)

Coded Value	Variable (LABEL)	University f (N=65)	%	Organization f (N=55)	%
	HOURS OF TV WATCHED PER WEEK (TV HRS)				
1	0-4 hours	26	40.0	23	41.8
2	5-8 hours	25	38.5	19	34.5
3	9-12 hours	8	12.3	4	7.3
4	13-16 hours	3	4.6	2	3.6
5	17-20 hours	3	4.6	6	10.9
6	More than 20 hours	0	0.0	0	0.0
	Missing Data	-	---	1	1.8
	Total	65	100.0	55	100.0
	Mean	1.95		2.06	
	SD	1.07		1.29	
	WATCH PUBLIC TELEVISION (PBS)				
1	Never	4	6.2	5	9.1
2	Occasionally	35	53.8	29	52.7
3	Often	26	40.0	21	38.2
	Total	65	100.0	55	100.0
	Mean	2.34		2.29	
	SD	0.59		0.63	

24.6% of the respondents in the university group indicated they owned/leased three or more cars as compared to 21.9% in the organization group (Table 11).

TABLE 11

Descriptive Statistics for the Variables: Own or Lease Car (CARS) and Number of Cars (NMBRCARS)

Coded	Variable (LABEL)	University f (N=65)	%	Organization f (N=65)	%
	Own or Lease Car (CAR)				
1	Yes	65	100.0	53	96.4
2	No	0	0.0	2	3.6
	Total	65	100.0	55	100.0
	Number of Cars Owned or Leased (NMBRCARS)				
0	0	0	0.0	2	3.6
1	1	18	27.7	11	20.0
2	2	31	47.7	30	54.5
3	3	10	15.3	8	14.5
4	4	4	6.2	4	7.3
5	5	2	3.1	0	0.0
6	more than 5	0	0.0	0	0.0
	Total	65	100.0	55	100.0
	Mean	2.09		2.02	
	SD	0.98		0.89	

Table 12 shows that the vast majority of both groups owned their own home/apartment. More organization respondents (52.7%) resided in a county with a population of 150,000-1.5 million people than their university counterparts (32.3%). Most university respondents (46.2%) resided in counties with a population of 35,000-150,000 people.

TABLE 12

Descriptive Statistics for the Variables: Own or Rent Residence (HOUSING) and Population of County of Residence (COUNTY)

Coded Value	Variable (LABEL)	University f (N=65)	%	Organization f (N=55)	%
	Own or Rent Residence (HOUSING)				
1	Own Home/Apartment	55	84.6	42	76.4
2	Rent Home/Apartment	10	15.4	12	21.8
blank	Missing Data	0	0.0	1	1.8
	Total	65	100.0	55	100.0
	Population of County of Residence (COUNTY)				
1	less than 35,000	8	12.3	5	9.1
2	35,000-150,000	30	46.2	19	34.5
3	150,000-1.5 million	21	32.3	29	52.7
4	more than 1.5 million	6	9.2	2	3.6
	Total	65	100.0	55	100.0
	Mean	2.38		2.51	
	SD	0.82		0.72	

Table 13 summarizes data on the publications read frequently by study groups on a regular basis (one-half or more of the issues in a calendar year). The National Geographic, the Journal of Environmental Education, and Time were read most frequently by the university group. Respondents from environmental organizations indicated that their preferences were the National Geographic, Audubon, and the Smithsonian. The least-read publication in the organization group was the Journal of Environmental Education, while the least-read publication in the university group was Field and Stream.

TABLE 13

PUBLICATIONS READ BY RESPONDENTS

PUBLICATION	UNIVERSITY		ORGANIZATION	
	Yes	No	Yes	No
AUDUBON	27.7	72.3	45.5	54.5
FIELD AND STREAM	1.5	98.5	16.4	83.6
NEWSWEEK	29.2	70.8	20.0	80.0
TIME	38.5	61.5	21.8	78.2
SMITHSONIAN	20.0	80.0	34.5	65.5
NATIONAL GEOGRAPHIC	53.8	46.2	50.9	49.1
U.S. NEWS & WORLD REPORT	15.4	84.6	16.4	83.6
SCIENTIFIC AMERICAN	29.2	70.8	18.2	81.8
WALL STREET JOURNAL	9.2	90.8	14.5	85.5
JOURNAL OF ENVIRONMENTAL EDUCATION	50.8	49.2	12.7	87.3

Respondent involvement in selected environmental civic, or professional activities is summarized in Table 14. Each subject was asked to indicate actions he/she had done in the past twelve months. Results indicate that environmental organization representatives are more likely to write the editor of a newspaper or magazine or their congressperson and other elected officials about an environmental issue. Not unexpectedly, more university representatives indicated they had written something for publication in a professional journal or popular magazine. A higher percentage of university representatives indicated they had voted in an election within the past year. Similar results for both groups were obtained on variables related to membership and/or activity in an environmental or consumer group.

TABLE 14

INVOLVEMENT IN ENVIRONMENTAL ACTIVITY (CURINV 1-9)

	UNIVERSITY		ORGANIZATION	
	YES	NO	YES	NO
1. Voted in an election	84.6	15.4	67.3	32.7
2. Wrote to the editor of a magazine, newspaper, radio, or TV station	29.2	70.8	49.1	50.9
3. Gave a speech or addressed a public meeting on an environmentally-related topic.	78.5	21.5	83.6	16.4
4. Took active part in a civic or social issue.	53.8	46.2	56.4	43.6
5. Wrote to a Congressperson or other elected official about an environmental issue.	36.9	63.1	54.5	45.5
6. Wrote something for publication in a popular magazine or professional journal.	72.3	27.7	60.0	40.0
7. Alone, or in a group, visited representative(s) of an institution, government body, civic group or corporation to make known your point of view on an environmental issue.	29.2	70.8	47.3	52.7
8. Joined or continued membership in an environmental or consumer group.	80.0	20.0	87.3	12.7
9. Made a contribution to or worked for an environmental or consumer group.	66.2	33.8	67.3	32.7

90

Descriptive Statistics for the ECQ Data

Described in this section is the analysis of the placement of the Q-statements by the subjects in this study. The discussion focuses around the similarities and differences in the university and environmental organization group means on each of the Q-statements.

Examination of the tables in this section reveals that most of the mean values lie between ± 2. Reference is made to the Q-statement in terms of the number that was randomly assigned to each statement. That is, Q-22 is Q-statement number 22.

The Q-sorting process forced the subjects to sort six (6) cards into each of nine (9) piles. The two extremes for the piles were Most Important (+4) and Least Important (-4). That is, each statement was sorted in terms of its relative importance to all other statements. During the sorting procedure, each subject was asked to keep in mind the question, "What should a student know about the environment?"

Table 15 presents the means and standard deviations for responses to the Q-statements by the university and environmental organization groups. Q-49 and Q-15 were deemed to be more important than the other Q-statements by the university group. These two statements had the only means above +2. Only Q-15 had a mean above +2 in the environmental organization group. The means for eight (8) Q-statements (Q-2, Q-6, Q-11, Q-20, Q-23, Q-29, Q-12, Q-54) in the university group fell in the mean range of +1 to +2 as compared to 12 means within this range (Q-2, Q-6, Q-10, Q-11, Q-20, Q-23, Q-27, Q-28, Q-29, Q-44, Q-49, Q-52) for the environmental organization group.

Table 15

MEANS AND STANDARD DEVIATIONS OF CONCEPTS FOR
UNIVERSITY AND ENVIRONMENTAL ORGANIZATION GROUPS

Final Concept List	UNIVERSITY Mean	UNIVERSITY Standard Deviation	ORGANIZATION Mean	ORGANIZATION Standard Deviation
1. Environmental management involves the application of knowledge from many different disciplines	0.82	2.42	0.36	2.42
2. The management of natural resources to meet the needs of successive generations demands long-range planning.	1.66	1.59	1.40	2.38
3. Social values and customs influence personal conservation behavior.	-0.91	2.21	-1.76	2.34
4. Policies, including natural resource policies, come about as the result of interacting social processes: science and technology, government operations, private interests, and public attitudes.	-0.25	2.65	-0.18	2.48
5. Opportunities to experience and enjoy nature are psychologically rewarding to many and are important to mental health.	-1.32	2.39	-0.18	2.82
6. Individual citizens should be stimulated to become well informed about resource issues, problems, management procedures, and ecological principles.	1.09	2.42	1.46	2.10
7. As populations increase and/or as resource supplies decrease, the freedom of the individual to use the resource as he wishes decreases irrespective of the form of government.	0.06	2.52	0.91	2.47
8. The renewable resource base can be extended by reproduction, growth, and management.	-0.91	2.27	-0.27	2.33

Table 15 (Continued)

Final Concept List	UNIVERSITY Mean	UNIVERSITY Standard Deviation	ORGANIZATION Mean	ORGANIZATION Standard Deviation
9. Man is influenced by many of the same hereditary and environmental factors that affect other organisms and their populations.	-0.65	2.71	-0.98	2.18
10. Individuals tend to select short term economic gains, often at the expense of greater long term environmental benefits.	0.75	2.62	1.02	2.28
11. Man has a moral responsibility for his environmental decisions.	1.45	2.65	1.78	2.56
12. All living things, including man, are continually evolving.	-1.40	2.98	-1.24	2.75
13. Conservation policy is determined by the interaction of science and technology; social and political factors; and aesthetic, ethical, and economic considerations.	-0.17	2.38	-0.26	2.30
14. Man has the ability to manipulate and change the environment.	-0.22	2.63	0.06	2.41
15. Living things are interdependent with each other and their environment.	2.17	2.20	2.18	2.23
16. Choices between needs (essentials) and wants or desires (nonessentials) are often in conflict.	-0.25	2.47	-1.13	2.53
17. Resource depletion can be slowed by the development and adoption of alternatives.	0.54	1.74	0.55	2.11
18. Social and technological changes alter the inter-relationships, importance, and uses for natural resources.	-1.05	2.10	-1.16	2.06

Table 15 (Continued)

Final Concept List	UNIVERSITY Mean	UNIVERSITY Standard Deviation	ORGANIZATION Mean	ORGANIZATION Standard Deviation
19. An organism is a product of its heredity and environment	-0.74	2.73	-1.07	2.36
20. Options available to future generations must not be foreclosed.	1.28	2.48	1.04	2.60
21. Modern man affects the structure of his environment.	-0.34	2.22	-0.35	2.22
22. The economy of a region depends on the utilization of its natural, human, and cultural resources and technologies over time.	-1.34	2.00	-0.95	2.09
23. The natural environment is irreplaceable.	1.74	2.75	1.49	2.83
24. Environmental management has effects on individuals and social institutions.	-1.45	1.88	-1.46	1.97
25. Pollutants and contaminants are produced by natural and man-made processes.	-0.63	2.34	-1.06	2.35
26. Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts.	-0.79	2.53	-1.78	1.97
27. Conservation responsibilities should be shared by individuals, business and industries, special interest groups, and all levels of government and education	0.65	2.42	1.20	2.32

Table 15 (Continued)

Final Concept List	UNIVERSITY Mean	UNIVERSITY Standard Deviation	ORGANIZATION Mean	ORGANIZATION Standard Deviation
28. Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations.	0.31	2.93	1.38	2.61
29. Safe waste disposal, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes, and heat, is important if the well-being of man and the environment is to be preserved.	1.28	2.20	1.49	2.43
30. Knowledge of the social structures, institutions and culture of a society must be brought to bear on environmental considerations.	-0.12	2.38	-0.66	2.29
31. In any environment, one component like: space, water, air, or food may become a limiting factor	0.75	2.51	0.91	2.49
32. Man's need for food, fiber, and minerals increases as populations expand and levels of consumption rise.	-0.19	2.48	-0.24	2.16
33. Most resources are vulnerable to depletion to quantity, quality, or both.	0.85	2.23	0.36	1.94
34. The interaction of environmental and biological factors determines the size and range of species and populations.	-0.55	2.39	-0.84	1.95
35. There are certain risks taken, and limitations experienced, when manipulating the natural environment.	-0.26	2.46	0.60	2.42
36. Organisms and environments are in constant change.	-0.91	2.89	-0.82	2.55

Table 15 (Continued)

Final Concept List	UNIVERSITY Mean	UNIVERSITY Standard Deviation	ORGANIZATION Mean	ORGANIZATION Standard Deviation
37. Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.	0.40	2.31	0.76	2.21
38. Economic efficiency does not always result in conservation of a natural resource.	-0.49	2.47	-0.67	2.63
39. Man has been a factor affecting plant and animal succession and environmental processes.	0.11	2.18	0.62	2.28
40. Increased population mobility is changing the nature of demands upon some resources.	-2.089	1.96	-1.60	1.91
41. The rate of change in an environment may exceed the rate of organism adaptation.	-0.23	2.62	-0.04	2.40
42. Man has responsibility to develop an appreciation of and respect for the rights of others.	0.27	2.47	-0.62	2.88
43. Wildlife refuges, undistrubed natural areas, and preserves may be of value in protecting endangered species and perpetuating the gene pool.	-0.35	2.46	0.67	2.63
44. Water supplies, both in quantity and quality, are important to all levels of living.	0.60	2.25	1.15	2.53
45. The distribution or location of resources in relation to population, technology, and economic factors is critical to problems of resource conservation and use.	-0.45	2.26	-0.76	2.10
46. Conflicts emerge between private land use rights and the maintenance of environmental quality for the general public.	-0.40	2.30	-0.43	2.58

Table 15 (Continued)

Final Concept List	UNIVERSITY Mean	UNIVERSITY Standard Deviation	ORGANIZATION Mean	ORGANIZATION Standard Deviation
47. Man is developing the technical and sociological knowledge needed to control population growth, modify environments, and alter resource use patterns.	-1.17	2.13	-1.46	1.93
48. The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.	-2.02	2.36	2.35	1.87
49. Natural resources are interdependent and the use or misuse of one will affect others.	2.28	1.69	1.46	2.29
50. Increasing population and per capita use of resources have brought about changed land to man or resource to population ratios.	-0.43	2.44	-0.93	2.16
51. As populations increase, competition for the use of water increases, resulting in a need for establishing water use priorities.	-0.20	2.24	0.46	2.48
52. We have "legal" ownership of some resources, like real estate, and control over others during our lifetime, but ethically we are "stewards" rather than owners of the resource base.	1.17	2.40	1.31	2.52
53. Green plants are the ultimate sources of food, clothing, shelter, and energy in most socieities.	0.68	2.69	0.78	2.89
54. A knowledge of the social, physical and biological sciences, and humanities are important for environmental understanding.	1.45	2.51	0.11	2.53

The university group placed a low level of importance on Q-40 and Q-48, both having means below -2. The organization group also assigned a low level of importance to Q-48, making it the only statement with a mean value below -2 in this group. The mean for six (6) Q-statements (Q-5, Q-12, Q-18, Q-22, Q-24, Q-47) in the university group fell in the mean range of -1 to -2 as compared to 10 means within this range (Q-3, Q-12, Q-16, Q-18, Q-19, Q-24, Q-25, Q-26, Q-40, Q-47) for the environmental organization group.

Statements Q-14, Q-35 and Q-43 were rated negatively by the university group and positively by the organization group. On the other hand, Q-42 was rated positively by the university group and negatively by the organization group. Within the university group, twenty-three (23) Q-statements had positive means while thirty-one Q-statements had negative means. In the organization group, twenty-six (26) of the statements had positive means while twenty-eight (28) of the statements had negative means.

Table 16 presents the six (6) highest rated ECQ statements as identified by the university and environmental organization study groups. Statements Q-11, Q-15, Q-23 and Q-49 are common to both groups. The university group rated Q-2 and Q-54 higher than the other group. These two statements stress the need for long range planning in the management of natural resources and the interdisciplinary nature of knowledge that it is important to possess for environmental understanding. The organization valued Q-6 and Q-29 more than the university group. These concepts focus on the importance of well-informed citizens and concern over the relationships between safe waste disposal and man and the environment.

TABLE 16

SIX HIGHEST RATED ECQ STATEMENTS (By Group)

University

Concept Number	Concept Statement	Mean
2	The management of natural resources to meet the needs of successive generations demands long-range planning	1.66
11	*Man has a moral responsibility for his environmental decisions	1.45
15	*Living things are interdependent with each other and their environment	2.17
23	*The natural environment is irreplaceable	1.74
49	*Natural resources are interdependent and the use or misuse of one will affect others	2.28
54	A knowledge of the social, physical and biological sciences, and humanities are important for environmental understanding.	1.45
	Organizations	
6	Individual citizens should be stimulated to become well informed about resource issues, problems, management procedures, and ecological principles	1.46
11	*Man has a moral responsibility for his environmental decisions	1.78
15	*Living things are interdependent with each other and their environment	2.18
23	*The natural environment is irreplaceable	1.49
29	Safe waste disposal, including the reduction of harmful and cumulative experts of various solids, liquids, gases, radioactive wastes, and heat, is important if the well-being of man and the environment is to be preserved.	1.49

Table 16 (continued)

Concept Number	Concept Statement	Mean
49	*Natural resources are interdependent and the use or misuse of one will affect others	1.46

*Common to both groups

Table 17 presents the six (6) lowest rated ECQ statements as identified by the university and environmental organization groups. Statements Q-24, Q-40, and Q-48 are common to both groups. The university group placed a lower level of importance on statements Q-5, Q-12, and Q-22 than the organization group. These three statements emphasize evolution, factors influencing the economy of a region, and the importance to mental health of the opportunities to enjoy and experience nature. The organization group did not place as much importance on statements Q-3, Q-26, and Q-47 as the university group. Statements Q-3 examines the relationship between social values and customs and conservation behavior while Q-26 details the relationship between natural resources and the material welfare of a culture. Statement Q-47 emphasizes the development of technical and sociological knowledge to control environmental concerns.

TABLE 17

SIX LOWEST RATED ECQ STATEMENTS (By Group)

University

Concept Number	Concept Statement	Mean
5	Opportunities to experience and enjoy are psychologically rewarding to many and are important to mental health	-1.32
12	All living things, including man are continually evolving	-1.40
22	The economy of a region depends on the utilization of its natural, human, and cultural resources and technologies over time	-1.34
24	*Environmental management has effects on individuals and social institutions	-1.45
40	*Increased population mobility is changing the nature of demands upon some resources	-2.08
48	*The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny	-2.02

Organizations

3	Social values and customs influence personal conservation behavior	-1.76
24	*Environmental management has effects on individuals and social institutions	-1.46
26	Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts	-1.78
40	*Increased population mobility is changing the nature of demands upon some resources	-1.60

TABLE 17 (continued)

Concept Number	Concept Statement	Mean
47	Man is developing the technical and sociological knowledge needed to control population growth, modify environments, and alter resource use patterns	-1.46
48	*The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny	-2.35

*Common to both groups

The Test of Null Hypothesis 1

The null form of hypothesis 1 is as follows:

Null hypothesis 1 There are no significant differences in the importance of the ECQ-statements for the university representatives and environmental organizations, That is, the means for the ratings of importance of the fifty-four (54) ECQ statements are the same for each group.

In cases where the data are classified into two groups and the assumption of the equality of variances can be met, the groups can be compared using the *t* test. To test null hypothesis 1, fifty-four (54) *t*-tests were performed to compare the means of the placements of the ECQ statements by study group. The computer analysis was performed on the SPSS (Nie, *et al.*, 1975) subprogram T-TEST. *F* tests were conducted on the variances of the two groups for the fifty-four (54) statements to test the equality of the variances. None of the *F* values testing the equality of variances for the two groups on each statement was significant ($p \leq .05$), therefore, it was assumed that the variances for

the two groups on each statement were equal. With this many comparisons, the alpha level is subject to inflation. Of the 54 comparisons, it is expected that three will be significant by chance alone ($p \leq .05$).

Results of the t-tests showed that no sifnificant differences ($p \leq .05$) in group means existed for forty-six (46) of the fifty-four (54) ECQ statements. Significant differences ($p \leq .05$) existed for eight (8) statements. These results are summarized in Table 18.

Examination of Table 18 shows that five (5) of the t values have positive values and three (3) possess negative values. A positive value indicates the mean of the university group was the higher value while a negative t value indicates that the mean of the environmental organization group has the higher value. Those statements rated higher by the university group appear to emphasize cultural aspects, ethics and responsibility, and the interdisciplinary nature of knowledge for environmental understanding. Statements rated higher by the organization group stress enjoyment of nature, the value of natural areas and wildlife refuges, and the importance of family planning. Null hypothesis 1 was rejected for the eight (8) statements listed in Table 18 and not rejected for the forty-six (46) other concepts.

TABLE 18

T-TEST OF ECQ STATEMENT GROUP MEANS ($p \leq .05$)

Statement Number	ECQ-Statement	T-Value	p	Effect
5	Opportunities to experience and enjoy nature are psychologically rewarding to many and are important to mental health	-2.42	.017*	
16	Choices between needs (essentials) and wants or desires (non-essentials) are often in conflict	2.14	.035*	
26	Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts	2.40	.018*	
28	Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations	-2.00	.048*	
42	Man has responsibility to develop an appreciation of and respect for the rights of others	2.07	.041*	
43	Wildlife refuges, undisturbed natural areas, and preserves may be of value in protecting endangered species and perpetuating the gene pool	-2.37	.019*	
49	Natural resources are interdependent and the use or misuse of one will affect others	2.54	.012*	
54	A knowledge of the social, physical and biological sciences, and humanities are important for environmental understanding	2.92	.004**	

*$p \leq .05$
**$p \leq .01$

Factor Analysis of the Placement of the Q-Statements

Presented in this section are the results of the factor analysis of the placement of the Q-statements by the respondents. The BMD (Brown, et al., 1977) subprogram P4M was used in the factor analysis of the data. P4M performed a factor analysis of the correlation matrix of the data (Appendix J). Initial factor extraction was by principal components with orthogonal rotations being developed.

Initially, three (3) factor analyses were performed. First, the data for the university group (UNIVERSITY: 65 persons) were factor analyzed. Second, the data for the environmental organization group (ORGNZTON: 55 persons) were factor analyzed. Finally, the data for all respondents (COMBINED: 120 persons) were grouped together and factor analyzed.

Examination of the results of the three different factor analyses yielded no major differences in interpretations as related to the objectives of this study. Therefore, the decision was made to use the combined data for all respondents as the basis of further investigation and interpretation. The results of the combined factor analysis are presented in Appendix J.

Examination of the factor matrix with 54 factors suggested that an eight (8) factor solution would provide the most logical and constant basis for further interpretation. An eight (8) factor solution was developed that accounted for 43.9% of the variance in the rankings of the fifty-four (54) Q-statements.

TABLE 19

Eigenvalues and Cumulative Proportion of Total Variance for the Eight (8) Factor Solution

Factor	Eigenvalue	Cumulative Percent (%) of Total Variance	Added Variance (%)
I	5.907	10.9	10.9
II	3.933	18.2	7.3
III	3.153	24.1	5.9
IV	2.714	29.1	5.0
V	2.299	33.3	4.2
VI	2.092	37.2	3.9
VII	1.908	40.8	3.6
VIII	1.713	43.9	3.1

At this point, the criterion of substantive importance was applied to the eight (8) factor solution. This criterion focuses on what should be the minimum contribution by a factor to be evaluated as substantially significant. That is, what percent of the total variance must be explained by the last factor retained? Kim and Mueller (1977) suggest one percent, five percent, or ten percent as possibilities, but note that the criterion is set by the researcher at whatever level is considered substantively important to the study. The criterion of substantive importance for this study was set at four percent (4%) of the total variance.

As observed in Table 19, Factors VI, VII, and VIII do not meet this criterion of substantive importance and are therefore omitted from further discussion in this study. The results are discussed in terms of the

remaining five (5) factors. The five (5) factors account for 33.3% of the variance in the rankings of the fifty-four (54) Q-statements. For each respondent, factor scores were punched on computer cards for use in later analyses.

Tables 16-20 present the results of the factor analysis. A factor loading of 0.40 or greater was the criterion for using a Q-statement to represent a factor. The emphasis in the remainder of this section is on naming, describing, and discussing the underlying dimensions.

Factor I

Table 20 lists the Q-statements common to Factor I and provides rotated factor loadings. During the Q-sorting process each respondent was requested to keep the following question in mind: What should a student know about the environment?

TABLE 20

Factor Loadings of Q-Statements
Chosen to Represent Factor I: Ecology

Concept Statement	Concept Number	Rotated Factor Loading
All living things, including man, are continually evolving	12	0.72[a]
Organisms and environments are in constant change	36	0.68
An organism is a product of its heredity and environment	19	0.63
Living things are interdependent with each other and their environment	15	0.54

TABLE 20 (continued)

Concept Statement	Concept Number	Rotated Factor Loading
Green plants are the ultimate sources of food, clothing, shelter, and energy in most societies	53	0,53
Man is influenced by many of the same hereditary and environmental factors that affect other organisms and their populations	9	0.51
The rate of change in an environment may exceed the rate of organism adaptation	41	0,46
The interaction of environmental and biological factors determines the size and range of species and populations	34	0.44

Variance explained by Factor I - Ecology (10.94%)

[a]Factor loadings rounded to nearest hundreth

This dimension of the set of environmental education concepts accounts for 10.9% of the variance and was named Ecology: Interdependence and Living Things. The theme of the factor appears to be the interaction of living things and their environment, and the impact of change upon the resultant dynamic system. The two strongest loading Q-statements appear to stress evolution and change.

Factor II

Table 21 lists the Q-statements common to Factor II and provides rotated factor loadings on the Q-statements.

TABLE 21

Factor Loadings of Q-Statements
Chosen to Represent Factor II: Culture

Concept Statement	Concept Number	Rotated Factor Loading
The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny	48	0.60[a]
Social values and customs influence personal conservation behavior	3	0.60
Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts	26	0.56
Knowledge of the social structures, institutions, and culture of a society must be brought to bear on environmental considerations	30	0.46
Social and technological changes alter the interrelationships, importance and uses for natural resources	18	0.42

Variance explained by Factor II - Culture (7.3%)

[a]Factor loading rounded to nearest hundreth

This dimension of the set of environmental education concepts accounts for 7.3% of the variance and was named Culture: Interaction with Environmental Considerations. The theme of this factor concerns the interaction among customs, social values, beliefs and attitudes which eventually has an effect upon the conservation behavior of the individual. The two (2) strongest loading Q-statements stress behavior and the conditions influencing it.

Factor III

Table 22 lists the Q-statements common to Factor III and provides rotated factor loadings on the statements.

TABLE 22

Factor Loadings of Q-Statements
Chosen to Represent Factor III: Ethics

Concept Statement	Concept Number	Rotated Factor Loading
Man has a moral responsibility for his environmental decisions	11	0.64[a]
Options available to future generations must not be foreclosed	20	0,59
Man has responsibility to develop an appreciation of and respect for the rights of others	42	0,57
The natural environment is irreplaceable	23	0,53

Variance explained by Factor III - Ethics (5.9%)

[a]Factor loadings rounded to nearest hundreth

This dimension of the set of environmental education concepts accounts for 5.9% of the variance and named Ethics: Mankind's Moral Responsibility for Environmental Considerations. The theme of the factor appears to be that humans have a responsibility not only to themselves, but to other species as well. This responsibility transcends immediate needs in that environmental decisions made today can seriously impact the availability of choice to future generations.

Factor IV

Table 23 lists the Q-statements common to Factor IV and provides rotated factor loadings on the statements:

TABLE 23

Factor Loadings of Q-Statements
Chosen to Represent Factor IV; Resource Use

Concept Statement	Concept Number	Rotated Factor Loading
Water supplies, both in quantity and quality, are important to all levels of living	44	0.71[a]
Safe waste disposal, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes, and heat, is important if the well-being of man and the environment is to be preserved	29	0.64
As populations increase, competition for the use of water increases, resulting in a need for establishing water use priorities	51	0.53
Natural resources are interdependent and the use or misuse of one will affect others	49	-0.51

Variance explained by Factor IV - Resource Use (5.0%)

[a]Factor loadings rounded to nearest hundreth

This dimension of the set of environmental education concepts accounts for 5.0% of the variance and was named Natural Resources; Management and Use. The underlying theme of this factor seems to be the management implications inherent in the human utilization of the natural resource base. The negative loading Q-statement could imply a concern for all natural resources and not just the water emphasized

in two of the top three loading statements,

Factor V

Table 24 lists the Q-statements common to Factor V and provides rotated factor loadings on the statements:

TABLE 24

Factor Loadings of Q-Statements
Chosen to Represent Factor V: Population

Concept Statement	Concept Number	Rotated Factor Loading
Increasing population and per capita use of resources have brought about changed land to man or resource to population ratios	50	0,55[a]
Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations	28	0,54
As populations increase and/or as resource supplies decrease, the freedom of the individual to use the resource as he wishes decreases irrespective of the form of government	7	0,49
Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination	37	0,43

Variance explained by Factors - Population (4.2%)

[a]Factor loading rounded to nearest hundreth

This dimension of the set of environmental education concepts accounts for 4.2% of the variance and was named Population: Interaction

with environmental conservation. The major theme of this factor appears to be the interaction between increasing human population and the probable consequences of that action: a decreased standard of living, loss of personal freedom, and increasing environmental contamination. This is the underlying theme of the "tragedy of the commons."

Summary of the Factor Analysis Results

The factor analysis of the data produced by the ECQ for all respondents combined produced an eight (8) factor solution. Of these eight (8) factors, five (5) met the criterion of substantive importance and were retained for interpretation. From these five (5) factors, inferred dimensions of a set of environmental education concepts were developed and named. The inferred dimensions accounting for a total of 33.3% of the variance were:

I Ecology: Interdependence and living things;

II Culture: Interaction with Environmental Considerations;

III Ethics: Mankind's Moral Responsibility for Environmental Considerations;

IV Natural Resources: Management and Use;

V Population: Interaction with Environmental Conservation

The Test of Null Hypothesis 2

The null form of Hypothesis 2 is as follows:

Null Hypothesis 2 There are no significant differences in the factor scores of the university representatives and the representatives from environmental organizations on each of the inferred dimensions of a set of concepts

It was decided that the factor scores for a given factor could be treated as values of a variable representing that factor. The factor scores were generated by the BMD (Brown, et al., 1977) subprogram P4M. Due to the use of an orthogonal rotation in the factor analysis solution, the factor scores are independent. To test null hypothesis 2, five (5) analyses of variance were performed treating a respondent's factor scores on a given factor as the dependent variable and group membership (university or environmental organization) as the independent variable. The computer analysis was performed on the BMD (Brown, et al., 1977) subprogram P1V.

Table 25 presents the standard score means for each groups factor scores. Table 26 provides a summary of the analysis of variance of the factor scores by group membership. Table 27 presents a summary of the results of the analysis of variance which were used to test null hypothesis 2.

TABLE 25

Standard Score Means for Factor Scores by Group Membership

Factor	GROUP MEMBERSHIP University	Organization
I Ecology	0.0094	-0.0112
II Culture	0.2246	-0.2654
III Ethics	0.0033	-0.0039
IV Natural Resources	-0.2033	0.2405
V Population	0.0157	-0.0184

TABLE 26

Summary of Analyses of Variance of Factor Scores by Group Membership

Factor	Source of Variance	df	MS	F	p
I Ecology	Between	1	0.013	0.013	0.911
	Error	118	1.018		
II Culture	Between	1	7.152	7.546	0.007**
	Error	118	0.948		
III Ethics	Between	1	0.002	0.002	0.969
	Error	118	1.008		
IV Natural Resources	Between	1	5.868	6.120	0.015*
	Within	118	0.959		
V Population	Between	1	0.035	0.034	0.853
	Within	118	1.008		

* $p \leq .05$
** $p \leq .01$

Null Hypothesis 2 was rejected for both Factor II - Culture and Factor IV - Natural Resources. The factor score means for Factor II - Culture were 0.2246 for the university group and -0.2654 for the environmental organization group. The analysis of variance between Factor II - Culture and the independent variable, group membership, showed significant differences existed between the group means ($F = 7.546$, $p \leq .01$). The factor score means for Factor IV - Natural Resources were -0.2033 for the university group and 0.2405 for the environmental organization group. The analysis of variance between Factor IV - Natural Resources and the independent variable, group membership, showed significant differences existed between the group means ($F = 6.120$, $p \leq .05$).

Null Hypothesis 2 was not rejected for Factor I - Ecology, Factor III - Ethics, or Factor V - Population as significant differences were not found to exist between the factor score means for these factors and the independent variable, group membership. A summary of the results of the analysis of variance used the test null hypothesis 2 are presented in Table 27.

TABLE 27

Summary of the Tests of Null Hypothesis 2

Factor Name	Null Hypothesis 2	p
I Ecology	not rejected	0.911
II Culture	rejected	0.007
III Ethics	not rejected	0.969
IV Natural Resources	rejected	0.015
V Population	not rejected	0.853

Multiple Regression Analysis

The Test of Null Hypothesis 3

The null form of Hypothesis 3 is as follows:

> Null Hypothesis 3 There are no significant predictors or combinations of predictors among the variables; (a) age; (b) sex; (c) amount of education; (d) publications read; (e) automobiles owned; (f) housing; (g) television viewing patterns; (h) community involvement; (i) population of county of residence; (j) group membership; and the ratings of the underlying dimensions of a set of environmental education concepts.

Stepwise multiple regression was used to test null hypothesis 3. As previously stated, factor scores had been produced by the BMD (Brown, et al., 1977) P4M subprogram for the five factors that met the criterion of substantive importance. These factor scores were treated as values of the variables representing the factors. In the multiple regression analyses, these scores were considered the dependent variables. The independent variables used to test null hypothesis 3 were:

Variable Description	Variable Label
Gender of respondent	SEX
Age of respondent	AGE
Amount of education	EDUCATION,CLLGEDN,UNDGMJR, GRADMJR
Car ownership	CARS,NMBRCARS
Own or rent house/apartment	HOUSING
Population of county of residence	COUNTY
Television viewing patterns	TVHRS,PBS

Publications read regularly	AUDUBON,FIELDSTM,NEWSWEEK, TIME, SMITHSAN, NTLGEOG, USNEWSWR, SCIAMRCN, WALLSTJL, JRENVEDN
Community involvement	CURINV1, CURINV2, CURINV3, CURINV4, CURINV5, CURINV6, CURINV7, CURINV8, CURINV9
Group membership	GROUP

The dependent variables used to test null hypothesis 3 were:

Factor I: Ecology	FACTOR1
Factor II: Culture	FACTOR2
Factor III: Ethics	FACTOR3
Factor IV: Natural Resources	FACTOR4
Factor V: Population	FACTOR5

Table 28 presents the correlation coefficients between the predictor variables and the factor scores. Tables 29-38 present the results of the regression analyses in terms of each factor. The statistical significance of the F ratio($p \leq .05$) and the percent of the variance accounted for (an increase in R^2 of $\simeq$ 4%) were considered as criteria for the interpretation of a variable as a predictor. Discussion will be based on those variables.

Examination of Table 28 reveals that the variables, CURINV6 (Published in a professional journal or magazine) and CURINV3 (Gave a speech or addressed a public meeting on an environmentally related topic) both correlated positively with Factor I: Ecology. A strong negative correlation (-0.238) exists between the variable, group membership (GROUP) and Factor II: Culture. Reading Audubon magazine (AUDUBON) also correlated negatively with Factor II: Culture. The variables, NEWSWEEK and JRENVEDN (Reading Newsweek and the Journal of

Environmental Education) correlated positively with Factor II; Culture. Watching PBS television (PBS) was the only variable that correlated significantly ($p \leq .05$) with Factor III; Ethics. A positive correlation existed between the variables, group membership (GROUP) and reading U.S. News and World Report (USNEWSWR), and Factor IV: Natural Resources. There is a significant ($p \leq .05$) negative correlation between Factor IV: Natural Resources and each of the following five variables: the Journal of Environmental Education (JRENVEDN); Time magazine (TIME); Scientific American (SCIAMRCN); Gave a speech or addressed a public meeting on an environmentally-related topic (CURINV3); and college education (CLLGEDN). The variable, CURINV7 (Visited representatives of an institution, government body, civic group, or corporation to make known a point of view on an environmental issue) correlated negatively with Factor V: Population.

Factor I - Ecology: Interdependence and Living Things

Tables 29 and 30 show that the variable CURINV6 (wrote something for publication in a professional journal or popular magazine) was a significant positive predictor for Factor I: Ecology.

These results suggest that those individuals who had written something for publication in a professional journal or popular magazine tended to favor this factor more than those who had not published. The prediction of Factor I: Ecology is enhanced when the educational record of the individual is considered along with publication record. Individuals who publish and have not attended college tended to favor Factor I: Ecology more than others. Or, individuals who do not publish and attended college, tend to favor Factor I: Ecology more than the other factors.

TABLE 28

Correlation Coefficients Between Regression Analysis
Predictor Variables and Factor Scores

PREDICTOR VARIABLES	FACTOR I	FACTOR II	FACTOR III	FACTOR IV	FACTOR V
CURINV6	0.217*	-0.066	0.020	-0.164	-0.010
CLLGEDN	-0.126	0.154	-0.054	-0.194*	-0.088
SCIAMRCN	-0.166	-0.016	0.084	-0.181*	0.085
CURINV3	0.185*	-0.126	0.081	-0.218*	-0.092
GROUP	0.006	-0.238**	-0.006	0.247**	-0.011
NEWSWEEK	-0.092	0.227**	0.076	0.069	-0.171
AUDUBON	-0.044	-0.191*	0.131	0.081	0.056
JRENVEDN	0.032	0.201*	0.046	-0.293**	-0.133
PBS	-0.008	0.048	0.214*	-0.069	-0.031
CURINV4	0.069	-0.083	0.166	-0.079	-0.011
CURINV5	-0.042	-0.077	0.079	0.031	0.022
SMITHSAN	-0.065	0.021	0.071	-0.066	-0.1537

TABLE 28 (continued)

PREDICTOR VARIABLES	FACTOR I	FACTOR II	FACTOR III	FACTOR IV	FACTOR V
USNEWSWR	-0.073	0.009	0.116	0.196*	-0.172
CURINV1	-0.096	-0.012	0.008	-0.073	-0.165
TIME	-0.070	0.051	-0.119	-0.253**	0.092
CURINV7	0.119	-0.119	0.074	-0.010	-0.188*

* $p \leq .05$, $|r| \geq .175$

** $p \leq .01$, $|r| \geq .228$

The prediction of Factor I is enhanced by information about an individual's publication record and educational background. Null hypothesis 3 was rejected for Factor I - Ecology: Interdependence and Living Things

TABLE 29

Stepwise Multiple Regression Results for Factor I; Ecology

Variable	r Simple	r Multiple	R^2	R^2 Change	F
CURINV6	.217	0.217	0.047	0.047	5.78**
CLLGEDN	-.126	0.266	0.071	0.024	2.98*
SCIAMRCN	-.166	0.304	0.093	0.022	2.79*
CURINV3	-.217	0.338	0.114	0.021	2.78*

* $p \leq .05$
** $p \leq .01$

TABLE 30

Variables in the Equation for Prediction of Ratings for Factor I: Ecology

Variable	Raw Score Coefficient	STD. Error of Coefficient	STD. Regression Coefficient
CLLGEDN	-0.715	0.437	-0.145
SCIAMRCN	-0.375	0.204	-0.163
CURINV3	0.381	0.228	0.152
CURINV6	0.392	0.193	0.187

(Y-Intercept 0.221)

Factor II - Culture: Interaction with Environmental Considerations

Tables 31 and 32 indicate that group membership (university and environmental organization) is a negative predictor and reading Newsweek (NEWSWEEK) on a regular basis is a positive predictor of Factor II.

The test of null hypothesis 2 showed significant differences in the factor scores on this factor when group membership was the independent variable of a one-way analysis of variance. Those results, plus the results of the regression analysis, strongly suggest that the development of this factor is related to group membership.

This suggests that individuals in the university group tend to favor this factor more than individuals from the environmental organization group. The prediction of Factor II is enhanced when the reading of Newsweek is considered along with group membership. Individuals in the university group who do not read Newsweek on a regular basis tended to favor Factor II more than the other factors.

Information about group membership and whether or not Newsweek is read on a regular basis enhance the prediction of Factor II. There appears to be some indication that those in the environmental organization group not reading Audubon but reading the Journal of Environmental Education give Factor II a higher level of importance. Null hypothesis 3 was rejected for Factor II - Culture: Interaction with Environmental Considerations.

TABLE 31

Stepwise Multiple Regression Results
for Factor II: Culture

Variable	r Simple	r Multiple	R^2	R^2 Change	F
GROUP	-0.238	0.238	0.057	0.057	7.05**
NEWSWEEK	0.227	0.314	0.098	0.041	5.34**
AUDUBON	-0.191	0.349	0.122	0.024	3.10*
JRENVEDN	0.202	0.378	0.143	0.021	2.76*

* $p \leq .05$

** $p \leq .01$

TABLE 32

Variables in the Equation for Prediction
of Ratings for Factor II; Culture

Variable	Raw Score Coefficient	STD. Error of The Coefficient	STD. Regression Coefficient
GROUP	-0.240	0.195	-0.120
AUDUBON	-0.358	0.184	-0.173
NEWSWEEK	0.496	0.200	0.216
JRENVEDN	0.333	0.201	0.158

(Y-Intercept 0.250)

Factor III - Ethics: Mankinds Moral Responsibility for Environmental Considerations

Tables 33 and 34 show that the variables, PBS (watch PBS television) and CURINV4 (took active part in a civic or social issue), are positive predictors for Factor III.

This suggests that those individuals who frequently watch PBS television tend to favor this factor more than those who do not watch PBS television. The prediction of Factor III is enhanced when an individual's involvement in a civic or social issue is considered along with watching PBS television. There appears to be a tendency for those who indicated they take an active part in civic or social issues to favor Factor III more than the other factors.

Information about watching PBS television and possibly an individual's involvement in civic or social issues enhances the prediction of Factor III. Null hypothesis 3 was rejected for Factor III - Ethics; Mankinds Moral Responsibility for Environmental Considerations.

TABLE 33

Stepwise Multiple Regression Results for Factor III: Ethics

Variable	r Simple	r Multiple	R^2	R^2 Change	F
PBS	0.214	0.214	0.046	0,046	5.61**
CURINV4	0.166	0.272	0.074	0,028	3.52**

** $p \leq .01$

TABLE 34

Variables in the Equation for Prediction of Ratings for Factor III: Ethics

Variable	Raw Score Coefficient	STD. Error of the Coefficient	STD. Regression Coefficient
PBS	0.355	0.148	0.215
CURINV4	0.337	0.179	0.168

(Y-Intercept -1.007)

Factor IV: Natural Resources and Factor V: Population

Tables 35-38 present the results of the regression analysis of Factor IV - Natural Resources: Management and Use and Factor V: Population: Interaction with Environmental Conservation.

The interpretations of Factor IV and Factor V are vague. Journal reading habits appear to be the best predictors of Factor IV. For example, individuals not reading the Journal of Environmental Education, but reading US News and World Report tend to assign a higher level of importance to Factor IV. Factor V is complex and none of the predictors meet the criterion of accounting for an approximate increase in variance (Increase in R^2) of four percent (4%). There may be some indication that individuals who are willing to make personal contact with representatives of an institution, government body, civic group or corporation tend to favor this factor more than others.

TABLE 35

Stepwise Multiple Regression Results
for Factor IV: Natural Resources

Variable	r Simple	r Multiple	R^2	R^2 Change	F
JRENVEDN	-0.293	0.293	0.086	0.086	10.97**
USNEWSWR	0.196	0.366	0.134	0.048	6.47**
TIME	-0.253	0.413	0.171	0.037	5.10**
CURINV3	-0.218	0.450	0.202	0.031	4.51**
AUDUBON	0.081	0.472	0.224	0.022	3.10*
CLLGEDN	-0.194	0.492	0.242	0.018	2.70*
PBS	-0.069	0.501	0.260	0.018	2.70*
SCIAMRCN	-0.125	0.527	0.278	0.018	2.67*

* $p \leq .05$

** $p \leq .01$

TABLE 36

Variables in the Equation for Prediction of Ratings for Factor IV: Natural Resources

Variable	Raw Score Coefficient	STD, Error of The Coefficient	STD. Regression Coefficient
CLLGEDN	-0.710	0,405	-0,145
PBS	-0,222	0.136	-0.137
AUDUBON	0.405	0.174	0,198
TIME	-0.426	0,182	-0,201
USNEWSWR	0.527	0,220	0.197
SCIAMRCN	-0.314	0,192	-0,137
JRENVEDN	-0.424	0.177	-0.204
CURINV3	-0.570	0.212	-0.229

(Y-Intercept 1.793)

TABLE 37

Stepwise Multiple Regression Results
for Factor V: Population

Variable	r Simple	r Multiple	R^2	R^2 Change	F
CURINV7	-0.188	0.188	0,035	0.035	4.27**
SMITHSAN	-0.154	0,253	0.064	0.029	3,57**
USNEWSWR	-0.172	0.302	0.091	0,027	3.47*
SCIAMRCN	0.085	0.342	0.117	0,026	3.26*
NEWSWEEK	-0.171	0.390	0.152	0.035	4,68*
CURINV1	-0.165	0.415	0.172	0.020	2,80*

* $p \leq .05$

** $p \leq .01$

TABLE 38

Variables in the Equation for Prediction of Ratings for Factor V: Population

Variable	Raw Score Coefficient	STD. Error of The Coefficient	STD. Regression Coefficient
NEWSWEEK	-0.485	0.206	-0.211
SMITHSAN	-0.505	0.203	-0.224
USNEWSWR	-0.348	0.238	-0.128
SCIAMRCN	0.570	0.220	0.245
CURINV1	-0.354	0.212	-0.150
CURINV7	-0.376	0.183	-0.183

(Y-Intercept 0.593)

Null hypothesis 3 was rejected for any variable that met the established criteria for rejection ($F \leq .05$, increase in $R^2 \geq 4\%$). A summary of the results of the multiple regression analysis used to test null hypothesis 3 are presented in Table 39.

TABLE 39

Summary of the Tests of null hypothesis 3

Variable Name	null Hypothesis 3
A. age(AGE)	not rejected
B. sex(SEX)	not rejected
C. amount of education(CLLGEDN)	not rejected
D. Publications read	
Audubon(AUDUBON)	not rejected
Field and Stream(FIELDSTM)	not rejected
Newsweek(NEWSWEEK)	rejected
Time(TIME)	not rejected
Smithsonian(SMITHSAN)	not rejected
National Geographic(NTLGEOG)	not rejected
U.S. News and World Report(USNEWSWR)	rejected
Scientific American(SCIAMRCN)	not rejected
Wall Street Journal(WALLSTJL)	not rejected
Journal of Environmental Education (JRENVEDN)	rejected
E. automobiles owned(CARS)	not rejected
F. housing(HOUSING)	not rejected
G. television viewing patterns(PBS)	rejected

TABLE 39 (continued)

Summary of the Tests of null hypothesis 3

Variable Name	null hypothesis 3
H. Community Involvement	
CURINV1	not rejected
CURINV2	not rejected
CURINV3	not rejected
CURINV4	not rejected
CURINV5	not rejected
CURINV6	rejected
CURINV7	not rejected
CURINV8	not rejected
CURINV9	not rejected
I. population of county of residence (COUNTY)	not rejected
J. group membership	rejected

Summary of the Multiple Regression Analysis

Results of the regression analysis indicated that, with the exception of Factor II: Culture, individual characteristics or actions were more related to the development of the factors than group membership. Predictors meeting the criteria for significance in the study were:

Factor I: Ecology	publication record;
Factor II: Culture	group membership, Newsweek;
Factor III: Ethics	PBS television
Factor IV: Natural Resources	Journal of Environmental Education, U.S. News and World Report;
Factor V: Population	no predictors met the criteria

The following evidence was found in comparing priorities among the five underlying dimensions: Ecology, Culture Ethics, Natural Resources, and Population:

a. Ecology, tends to be of higher priority for individuals who are actively publishing articles in journals, periodicals or professional magazines;

b. Culture, tends to be of higher priority for individuals involved in higher education (colleges and universities). There is some evidence that individuals with interest in social or educational issues, as reflected by readers of the Journal of Environmental Education and Newsweek tend to place Culture higher than the other underlying dimensions.

c. Ethics is placed at the highest priority by those individuals who frequently watch or listen to Public Broadcasting System programs.

d. Natural Resources concepts are placed at the highest priority by members of the environmental organization group, particularly those who have not pursued advanced college education generally and in science specifically.

Comparison of the Underlying Dimensions Developed in this Study with the Concept Categories Proposed by Roth (1969) and Bowman (1972)

A major concern of this study was the structure (domain) underlying the set of environmental education concepts as developed by Roth (1969) and used in this study. Roth (1969) classified the 111 concepts produced in his study into 13 categories using a topical organization. These topics included: economics, environmental management, natural resources, socio-cultural environment, adaptation and evolution, management techniques, environmental ecology, the individual, politics, culture, psychological aspects, environmental problems and the family.

One concept, living things are interdependent with each other and their environment, was deemed so important that it was placed in a category by itself.

Bowman (1972) based on the consensus reached by a panel of experts, concluded that the concepts identified by Roth (1969) could be categorized into four (4) conceptual areas:

biophysical environment;

sociocultural environment;

environmental management; and

change and dynamics.

Subjects in Bowman's study (1972) could reject any of the concepts from Roth's (1969) list for the following reasons:

(1) the concept was not important to environmental education, or

(2) the concept could not be placed into one of the four conceptual areas provided.

This study suggests that the underlying structure of the set of environmental education concepts consists of five (5) factors. These factors were named:

I Ecology: Interdependence and Living Things;

II Culture; Interaction with Environmental Considerations;

III Ethics: Mankind's Moral Responsibility for Environmental Considerations;

IV Natural Resources; Management and Use

V Population: Interaction with Environmental Conservation

The five factor solution proposed by this study consists of twenty-five concepts. Table 40 presents the structure suggested for those concepts by this study and the structures provided by Bowman (1972) and Roth (1969).

TABLE 40

Concept Categories as Suggested by Roth (1969) and Bowman (1972) for the Twenty-five Concepts in the Five Factor Solution

Q#	TOWNSEND (1980)	BOWMAN (1972)	ROTH (1969)
12	Ecology	Change and Dynamics	Adaptation and Evolution
36	Ecology	Change and Dynamics	Adaptation and Evolution
19	Ecology	Biophysical Environment	Adaptation and Evolution
15	Ecology	Biophysical Environment	Placed in a Category by itself
53	Ecology	Biophysical Environment	Natural Resources

TABLE 40 (continued)

Q#	TOWNSEND (1980)	BOWMAN (1972)	ROTH (1969)
9	Ecology	Biophysical Environment	Adaptation and Evolution
41	Ecology	Change and Dynamics	Adaptation and Evolution
34	Ecology	Not Classifiable	Environmental Ecology
48	Culture	Socio-cultural Environment	Culture
3	Culture	Socio-cultural Environment	Socio-cultural Environment
26	Culture	Socio-cultural Environment	Socio-cultural Environment
30	Culture	Not Classifiable	Socio-cultural Environment
18	Culture	Not Classifiable	Environmental Management
11	Ethics	Socio-cultural Environment	Socio-cultural Environment
20	Ethics	Socio-cultural Environment	Management Techniques
42	Ethics	Socio-cultural Environment	Socio-cultural Environment
23	Ethics	Environmental Management	Environmental Ecology
44	Natural Resources	Not Classifiable	Natural Resources
29	Natural Resources	Environmental Management	Environmental Problems
51	Natural Resources	Not Classifiable	Natural Resources

TABLE 40 (continued)

Q#	TOWNSEND (1980)	BOWMAN (1972)	ROTH (1969)
49	Natural Resources	Environmental Management	Environmental Ecology
50	Population	Not Classifiable	Economics
28	Population	Environmental Management	The Family
7	Population	Not Classified	Politics
37	Population	Change and Dynamics	Environmental Problems

Comparison of the eight (8) concepts in Factor I; Ecology with the scheme proposed by Bowman (1982) suggests that subjects in her study may have experienced difficulty in differentiating between the biophysical environment and change and dynamics categories.

Close agreement exists between Factor II and Culture and Bowman's (1972) category of the sociocultural environment. The same agreement exists in Factor III in that the argument can be made that ethics are an important aspect of the sociocultural environment.

This study proposes that Factor IV has a strong Natural Resources orientation. It is probable that natural resources-oriented concepts carry an implication for management and subjects in Bowman's (1972) study may have focused on that aspect. Roth's (1969) categorization of these concepts leans toward the Natural Resources classification.

Even though each ECQ statement in Factor V; Population contains the word population or overpopulation, Roth (1969) and Bowman's (1972) studies did not identify this topic as a conceptual scheme for

categorization purposes. Results from this study suggest that this factor is an important aspect of the underlying structure of the set of environmental education concepts.

Based on the broad nature of the concepts and the categorization and statistical procedures available at the time, Roth (1969) and Bowman's (1972) studies represent credible efforts at providing structure to the set of environmental education concepts. The procedures detailed on this study to investigate the underlying structure of the set of environmental education concepts provide another alternative or directions for modification of existing models.

Summary of the Results

The results of the study were:

1. Based on the results of Roth (1969) and Bowman (1972), it was expected that a consensus would be reached on the relative importance of the statements within the ECQ and that the distribution of group means would be normal with the statement means at the extremes of the distribution falling into the +3 to +4 and -3 to -4 ranges. Results of this study indicate that a consensus of greater importance for a few concepts is not present and that most of the concepts were about equal in importance. The results seem to suggest that respondents had difficulty differentiating the relative importance of the ECQ statements used in the study.
2. Significant differences ($p \leq .05$) existed for eight statements and null hypotheses 1 was rejected for those eight statements. Statements rated higher by the university group emphasized culture, ethics and responsibility and the interdisciplinary nature of knowledge required for environmental understanding. Statements rated higher by the organization group stressed enjoyment of nature, the value of natural areas and wildlife refuges and the importance of family planning.

3. The factor analysis, with orthogonal rotation, of the data produced by the ECQ for all respondents combined results in five factors, which accounted for 33.3% of the variance. The five factors, the underlying dimensions of the set of environmental education concepts, were developed and named. The inferred dimensions were:

   I Ecology: Interdependence and Living Things;

   II Culture: Interaction with Environmental Considerations;

   III Ethics: Mankinds Moral Responsibility for Environmental Considerations;

   IV Natural Resources: Management and Use; and,

   V Population: Interaction with Environmental Conservation.

4. The factor scores for a given factor were treated as values of a variable representing that factor, An analysis of variance treating a respondent's factor scores on a given factor as the dependent variable and group membership as the independent variable showed significant differences existed in the factor score means for Factor II: Culture and Factor IV: Natural Resources.

5. The regression analysis indicated, with the exception of Factor II: Culture, that individual characteristics or acts of the respondents were more related to the development of the factors than group membership, Predictors meeting the criteria for significance in this study were:

   (1) Factor I: Ecology - publication record;

(2) Factor II: Culture - group membership; Newsweek;

(3) Factor III: Ethics - PBS television;

(4) Factor IV: Natural Resources - Journal of Environmental Education, U.S. News and World Report; and,

(5) Factor V: Population - no predictors met the criteria

6. A comparison of the underlying dimensions developed in this study with the concepts categories proposed by Roth (1969) and Bowman (1972) showed that while differences do exist, they can probably be explained by the general nature of the concepts which leaves many of them open to multiple categorization possibilities. Another possible explanation is the method of providing structure: the subjective nature of the individual versus the extraction of factors by the computer.

Chapter V

Summary, Implications and Recommendations

Summary of the Study

The study validated and determined the relative importance of a set of environmental education concepts and investigated the underlying structure of the domain of the set of concepts as perceived by two groups of individuals representing colleges/universities and environmental organizations. Predictors of the underlying dimensions were identified.

The compilation of concepts developed by Roth (1969) was selected to serve as the base set of concepts for the study. Roth's original list of 111 concepts was reduced to 54 concepts using an interdisciplinary panel consisting of members of the Advisory Committee to the School of Natural Resources, The Ohio State University and the Alumni-Industry-Agency Advisory Committee to the Division of Environmental Education, School of Natural Resources, The Ohio State University.

The refined list of 54 concepts, called the Environmental Concept Q-set (ECQ), was then sent to randomly selected members of the Board of the Alliance for Environmental Education for review as to the accuracy of the concept statements and their validity as fundamental concepts.

The Environmental Concept Q-set was developed in order to:

1. have a valid, comprehensive and current list of concepts;
2. provide a basis for the development of environmental education programs; and,
3. provide the basis for the investigation of the underlying structure (dimensions) of the domain of important concepts.

The validated set of 54 concept statements professionally printed on the back of computer cards became one of the two instruments for the study. A background questionnaire, the Information Sheet, was developed to secure information from the subjects concerning:

1. age;
2. sex;
3. amount of education;
4. publications read;
5. automobiles owned;
6. housing;
7. television viewing patterns;
8. community involvement; and
9. population of county of residence.

The two instruments were used to satisfy the problems proposed for the study:

1. To determine what relationships exist between the relative importance of concepts in environmental education and the variable-group membership (university versus environmental organization).
2. To identify the underlying dimensions to a set of environmental education concepts as perceived by two groups of individuals representing colleges/universities and environmental organizations.
3. To compare the strength of agreement of the university group and the organization group with the underlying dimensions of environmental education concepts.

4. To determine what relationships exist between the underlying dimensions of concepts and the variables: (a) age; (b) sex; (c) amount of previous education; (d) publications read; (e) automobiles owned; (f) housing; (g) television viewing patterns; (h) community involvement; and (i) population of county of residence.

The sample was drawn from two groups of individuals involved in environmental education:

(1) representatives of colleges and universities involved in teaching, research or extension, and

(2) representatives of environmental organizations that either by their goals or actions have indicated or expressed a concern or an interest in the environment or environmental education.

The university group (N=100) was randomly selected from a pool of names compiled from three sources:

(1) readers of the Journal of Environmental Education;

(2) participants in the 1978 and 1979 National Conference of the National Association of Environmental Education; and,

(3) contributors to Current Issues in Environmental Education, Volumes I-V (1975-1979) from colleges and universities.

The environmental organization group was randomly selected from a pool of organization names compiled from two sources:

(1) the Conservation Directory - 1979 of the National Wildlife Federation; and,

(2) the United States Government Manual (1979-1980)

The group was limited to those organizations that were interstate, national, or international in scope with headquarters located within the continental United States. It was decided to send the ECQ to the

public education or public information officer of the organization. If no such position existed, the instrument was sent to the highest ranked officer listed within the organization.

The Environmental Concept Q-set (ECQ), the Information Sheet, and ausiliary materials were mailed to 200 individuals on April 4, 1980. Twelve weeks later, the data collection phase of the study was concluded. There were 120 respondents representing a 60% response rate.

The test-retest method was used to determine the reliability of the ECQ. Two samples (N=5) were randomly drawn from each group, A range of four to twelve weeks passed between the first and second sorting of the ECQ. Pearson's r was used to calculate the correlation of each Q-statement with itself: the average coefficient was 0.57. The 25 concepts that are the components of the five-factor factor analysis solution have an average coefficient of correlation of 0,62.

Descriptive statistics, t-tests, factor analyses, analysis of variance, and regression analysis were used to test the null hypotheses. Factor scores from the five factor solution of all respondents combined were used as dependent variables in the tests of the null hypotheses.

Discussion of the Results

To determine the relative importance of each ECQ-statement, means and standard deviations were generated for each study group. t-tests were performed to compare the means of the placements of the 54 ECQ-statements by study group. Results showed that no significant differences ($p \leq .05$) in group means existed for 46 of the 54 ECQ-statements.

Significant differences ($p \leq .05$) existed for eight statements. Statements rated higher by the university group emphasized culture, ethics and responsibility, and the interdisciplinary nature of knowledge required for environmental understanding. Statements rated higher by the organization group stressed enjoyment of nature, the value of natural areas and wildlife refuges, and the importance of family planning.

The factor analysis of the concept placements of both groups combined produced eight factors. Of these eight factors, five met the criterion of substative importance and were retained for interpretation. These five were named and developed as the underlying dimensions of the set of environmental education concepts. The dimensions were:

I Ecology: Interdependence and Living Things. This underlying dimension accounts for 10.9% of the variance. The factor stresses the interaction of living things and their environment, and the impact of change upon the resultant dynamic system.

II Culture: Interaction with Environmental Considerations. This underlying dimension accounts for 7.3% of the variance. The theme of this factor concerns the interactions among customs, social values, beliefs, and attitudes which eventually has an effect upon the conservation behavior of the individual.

III Ethics: Mankinds Moral Responsibility for Environmental Considerations. This underlying dimension accounts for 5.9% of the variance. The theme of this factor appears to be that humans have a responsibility not only to themselves, but to other species as well. This responsibility transcends immediate needs in that environmental decisions made today can seriously impact the availability of choice to future generations.

IV Natural Resources: Management and Use. This underlying dimension accounts for 5.0% of the variance. The theme of this factor seems to be the management implications inherent in the human utilization of the natural resource base.

V Population: Interaction with Environmental Conservation. This factor accounts for 4.2% of the variance. The factor stresses the interaction between increasing human population and the probable consequences of that action: a decreased standard of living, loss of personal freedom, and increasing environmental contamination.

The factor scores for a given factor were treated as values of a variable representing that factor. An analysis of variance treating respondent factor scores on a given factor as the dependent variable and group membership as the independent variable showed significant differences existed in factor score means for Factir II: Culture and Factor IV: Natural Resources. Significant differences were not found to exist between the factor score means and group membership for Factor I: Ecology, Factor III: Ethics, and Factor V: Population.

Regression analysis, using the factor scores for the combined groups as the dependent variable and the variables from the Information Sheet as the independent variables was performed. Group membership was a significant predictor for Factor II: Culture. Significant predictors for Factor I: Ecology, Factor III: Ethics and Factor IV: Natural Resources were more related to individual actions or preferences than group membership. No significant predictors were found for Factor V: Population. Predictors meeting the criteria for significance ($F \leq .05$, increase in R^2 of $\simeq 4\%$) were:

Factor I: Ecology - publication record;
Factor II: Culture - group membership, Newsweek;

Factor III: Ethics - PBS television;
Factor IV: Natural Resources - the Journal of Environmental Education and U,S. News and World Report;
Factor V: Population - none

A comparison of the underlying dimensions developed in this study with the concept categories proposed by Roth (1969) and Bowman (1972) showed, that while differences do exist, they can probably be explained by the general nature of the concepts which leaves most of them open to multiple categorization possibilities. Another possible explanation is the method of providing structure: the subjective nature of the individual versus the extraction of factor by computer analysis.

Implications

(1) Roth (1969) and Bowman (1972) found a consensus in their studies that several concepts were considered much more important than the others. Results of this study indicate that a consensus on greater importance for a few concepts is not present and that most of the concepts were about equal in importance. Possibly environmental educators are viewing all environmental concerns and problems as being equally important.

(2) The concepts used in this study may be used in curriculum planning and development at all educational levels.

(3) Concepts related to culture were rated higher by the university group; concepts related to natural resources were rated higher by the environmental organization group. While this result was not unexpected, it does re-emphasize the need for input into the curriculum development process from individuals with diverse educational and occupational backgrounds.

(4) Investigation of the underlying structure of the domain of the environmental education concepts revealed five dimensions: Ecology, Culture, Ethics, Natural Resources and Population. These dimensions are viewed as necessary components of any environmental education curriculum.

(5) The following evidence found when comparing priorities among the factors Ecology, Culture, Ethics, Natural Resources and Population has implications for environmental education.

1. Ecology tends to be of higher priority for individuals who are actively publishing articles in journals, periodicals or popular magazines. Individuals with more education do not seem to favor ecology concepts as much as other individuals.

2. Culture tends to be of higher priority for those individuals involved in higher education than for others. Individuals with interests in social and educational issues as reflected by readers of the Journal of Environmental Education and Newsweek tend to place Culture higher than the other underlying dimensions.

3. Ethics is placed at the highest priority by individuals who watch or listen to the Public Broadcasting System programs.

4. Natural Resources concepts are placed at the highest priority by members of environmental organization groups, particularly those who have not pursued advanced college education generally and in science specifically.

(6) There is a tendency for individuals from the fields of history or the social and administrative sciences to be less responsive to this type of data gathering activity. The feelings and opinions of these people would be better heard if these individuals became more responsive to efforts to solicit information from them.

Recommendations for Future Research

(1) The definitions of the term "concept" and the associated referent terms need to be clarified. The multiple-use pattern currently in use promotes confusion and leads to difficulties in generalizing the results to other research studies.

(2) A "true" taxonomy of concepts for use in developing programs of instruction should be developed.

(3) Energy concepts and concepts associated with the urban environment and other concerns should be incorporated into the list of concepts.

(4) The effect of shortening the number of statements in the ECQ should be investigated. The 25 statements representing the five factor solutions could serve as the basis of additional study.

(5) The relationship between sex of the individuals and the development of the underlying dimensions should be investigated in a study that includes nearly equal numbers of males and females.

(6) The relationship between attitudes and the development of underlying dimensions should be investigated.

(7) The study should be repeated using the same design and procedures. The replication would determine the validity of the present findings.

(8) Studies similiar to this one should be conducted using each of the following groups separately or in various combinations:

a. secondary school teachers
b. elementary school teachers
c. agency personnel from all givernment levels
d. representatives from industry

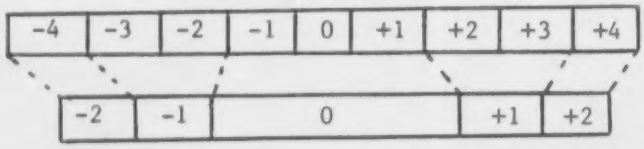
(9) Due to the use of an orthogonal rotation in the factor analysis solution, the five factors produced are independent, The data should be subjected to an oblique rotation and the results of this analysis compared with the orthogonal rotation.

(10) Examination of the test-retest reliability results (Table 3) indicates that several of the Q-set statements loading into the five factor solution exhibit low test-retest reliabilities ($p \leq .20$). Two possible interpretations are:

1. The statements are not well written and are therefore not understood; or,
2. The statements are "double barreled"; that is, they emphasize two or more different subjects or themes.

Based on the reliabilities of the statements in the sorts, there is a need to refine the statements exhibiting the low reliabilities.

(11) It is possible that a greater precision was assumed than is feasible from the nine category, Q-sort scale. A more reasonable expectation of precision on the Q-sort might be accomplished by the following:



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APPENDIX A

Roth's (1969) List of Concepts

Roth's (1969) Concept List and Means

1.	Living things are interdependent with each other and their environment.	4.85
2.	Safe waste disposal, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes and heat, is important if the well-being of man and the environment is to be preserved.	4.65
3.	Man has been a factor affecting plant and animal succession and environmental processes.	4.58
4.	The management of natural resources to meet the needs of successive generations demands long-range planning.	4.43
5.	Water supplies, both in quantity and quality, are important to all levels of living.	4.39
6.	Man has responsibility to develop an appreciation of and respect for the rights of others.	4.38
7.	Natural resources are interdependent and the use or misuse of one will affect others.	4.35
8.	Individual citizens should be stimulated to become well informed about resource issues, problems, management procedures and ecological principles.	4.30
9.	The earth and life on it are greatly affected by the atomsphere.	4.29
10.	Environmental management involves the application of knowledge from many different disciplines.	4.27
11.	Maintaining, improving, and in some cases, restoring soil productivity is important to the welfare of people.	4.25
12.	In any environment, one component like: space, water, air or food may become a limiting factor.	4.22
13.	Most resources are vulnerable to depletion in quantity, quality, or both.	4.17

14. Water is a reusable and transient resource, but the available quantity may be reduced or quality impaired.	4.17
15. Conservation responsibilities should be shared by individuals, businesses and industries, special interest groups and all levels of government and education.	4.16
16. An organism is the product of its heredity and environment.	4.14
17. As populations increase, competition for the use of water increases, resulting in a need for establishing water use priorities.	4.13
18. Pollutants and contaminants are produced by natural and man-made processes.	4.09
19. Modern man affects the structure of his environment.	4.08
20. Esthetic resources and recreational facilities of economic and noneconomic value are becoming increasingly important in leisure-time activities.	4.08
21. Man has ability to manipulate and change the environment.	4.02
22. Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental contamination.	4.01
23. Wildlife refuges, undisturbed natural areas, and preserves may be of value in protecting endangered species and perpetuating the gene pool.	3.99
24. A knowledge of the social, physical and biological sciences and humanities are important for environmental understanding.	3.98
25. Ready transportation, growing interest, money surpluses, and increased leisure time combine to create heavy pressures on existing recreation facilities and demands for new ones.	3.96
26. Man has moral responsibility for his environmental decisions.	3.94
27. Social and technological changes alter the interrelationships, importance and use for natural resources.	3.93
28. Outdoor recreation is an increasingly important part of our culture and our economy.	3.93

29. There are certain risks taken and limitations experienced when manipulating the natural environment.	3.92
30. Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.	3.88
31. Individual citizens should be stimulated to become active in the political process.	3.85
32. Resource depletion can be slowed by the development and adoption of alternatives.	3.85
33. The interaction of environmenal and biological factors determines the size and range of species and populations.	3.84
34. Man is influenced by many of the same hereditary and environmental factors that affect other organisms and their populations.	3.80
35. The economy of a region depends on the utilization of its natural, human and cultural resources and technologies over time.	3.80
36. Economic efficiency does not always result in conservation of a natural resource.	3.79
37. The rate of change in an environment may exceed the rate of organism adaptation.	3.76
38. Natural resources, water and minerals in particular, are unequally distributed with respect to land areas and political boundaries.	3.75
39. We have "legal" ownership of some resources like real estate and control over others during our lifetime, but ethically we are "stewards" rather than owners of the resource base.	3.75
40. Knowledge of the social structures, institutions and culture of a society must be brought to bear on environmental considerations.	3.75
41. The renewable resource base can be extended by reproduction, growth and management.	3.75
42. Environmental management has effects on individuals and social institutions.	3.74

43. The distribution or location of resources in relation to population, technological and economic factors are critical to problems of resources conservation and use.	3.73
44. Wildlife populations are important economically, aesthetically and biologically.	3.70
45. Man's need for food, fiber and minerals increases as populations expand and levels of consumption rise.	3.67
47. The political and economic strength of a country is, in part, dependent upon its access to domestic and foreign resources and international relationships.	3.67
48. Conflicts emerge between private land use rights and the maintenance of environmental quality for the general public.	3.66
49. The relationships between man and the natural environment are mediated by his culture.	3.65
50. An individual must develop his ability to perceive if he is to increase his awareness and develop environmental perspective.	3.62
51. Geological processes like erosion and deposition modify the landscape.	3.61
52. Increased population mobility is changing the nature of the demands upon some resources.	3.61
53. Conservation policy is determined by the interaction of science and technology; social and political factors; and aesthetic, ethical and economic considerations.	3.61
54. Opportunities to experience and enjoy nature are psychologically rewarding to many and are important to mental health.	3.60
55. Man is developing the technical and sociological knowledge needed to control population growth, modify environments and alter resource use patterns.	3.58
56. Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts.	3.58
57. Organisms and environments are in constant change.	3.56

58.	Green plants are the ultimate sources of food, clothing shelter and energy in most societies.	3.56
59.	Conventional benefit-cost analyses do not always result in sound conservation decisions.	3.54
60.	A sound natural resource policy is dependent upon a flexible political system, pragmatically appraising and reappraising policies and programs in terms of their effect upon the public interest and in light of scientific knowledge about the natural resources.	3.53
61.	The amount of precipitation that becomes available for use by man varies with topography, land use and applied management practices.	3.52
62.	Policies, including natural resources policies, come about as the result of interacting social processes: science and technology, government operations, private interests and public attitudes.	3.51
63.	Soil productivity can be maintained by utilizing known agronomic, mechanical and chemical processes.	3.51
64.	Conservation policies are often the result of group action.	3.51
65.	Options available to future generations must not be foreclosed.	3.51
66.	The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions and lifeways that are transmitted to its progeny.	3.50
67.	All living things, including man, are continually evolving.	3.49
68.	A variety of institutional structures are involved in planning and managing the environment.	3.49
69.	Consumption practices are constantly being expanded by our ability to produce and create wants and market, which affects the rate of resource use.	3.45
70.	A cultural and time lag exists between the development of knowledge in science and technology and application of that knowledge to resource and environmental problems.	3.44
71.	As populations increase and/or as resource supplies decrease, the freedom of the individual to use the resources as he wishes decreases irrespective of the form of government.	3.44

72. Plants are renewable resources.	3.44
73. Hunting regulations are useful in maintaining and restoring populations as well as in distributing the game harvest.	3.43
74. Multiple use is a practice in which a given land area functions in two or more compatible ways.	3.41
75. Energy is supplied to an ecosystem by the activities of green plants.	3.36
76. Management of habitat is considered to be an effective technique of wildlife management when the desire is to increase numbers of particular populations.	3.35
77. Social values and mores influence personal conservation behavior.	3.34
78. Architecture can be one of the positively persuasive influences in developing a congenial environment.	3.27
79. Man has psychobiological and biosocial needs.	3.27
80. Individuals tend to select short term economic gains, often at the expense of greater long term environmental benefits.	3.27
81. Mineral conservation involves the utilization of all known methods of using the minerals of the earth's crust that will cause them to serve more people for a longer time.	3.27
82. Human resources include the physical and mental abilities which man is endowed and the knowledge he has generated.	3.26
83. Wildlife is considered to be a public resource.	3.26
84. The form of life present depends upon the coincidence of the life needs and their availability in an environment.	3.25
85. Increasing population and per capita use of resources have brought changed land to man or resources to population ratios.	3.21
86. Zoning is a practice in which land uses are prescribed based upon value judgments regarding the needs of society.	3.20

87.	Goods and services are produced by the interaction of labor, capital, natural resources and technology.	3.18
88.	The nonrenewable resource base is considered finite.	3.18
89.	Long range planning for the use and allocation of natural and human resources is continually evolving.	3.17
90.	Choices between needs (essentials) and wants or desires (nonessentials) are often in conflict.	3.15
91.	Public opinion constitutes a control over the use of conservation practices.	3.11
92.	Biological systems are described as dynamic because the materials and energy involved are parts of continuous cycles; inorganic materials and energy become part of organic materials and are subsequently broken down into simpler substances and energy as a result of the operation of organic systems.	3.09
93.	Animal populations are renewable resources.	3.08
94.	Succession is the gradual and continuous replacement of one kind of plant or animal complex by another and is characterized by gradual changes in species composition.	3.03
95.	Individuals perceive different self-roles depending upon their position in the social and environmental context.	2.99
96.	Historically, cultures with high technological development have used more natural resources than those with lower levels of technological development.	2.98
97.	The natural environment is irreplaceable.	2.96
98.	Raw materials and energy supplies are generally obtained from those resources and places where they are available at least cost, usually in short economic terms.	2.96
99.	Man has the capability of improving society through sociology, psychology and science.	2.95
100.	Soil is classified as a renewable resource but, because it may take a few years to thousands of years to be "renewed", it is more practially termed a depletable resource.	2.94

101.	In a democracy, a basic theory is that increasing restrictions on resource allocation and use are imposed by the consent or insistence of the people.	2.92
102.	Minerals are nonrenewable resources.	2.87
103.	Supply and demand, in relation to values held by society, determines what is a resource and its economic values.	2.86
104.	Man is a high animal form because of his ability to reason.	2.83
105.	The need of man to turn inward for self-renewal can be stimulated by his external esthetic experiences.	2.80
106.	Resources have a psychological impact on people.	2.79
107.	The more efficient use of some resources is the result of technical and marketing improvements.	2.76
108.	Man is continually developing an ethical base for making value judgments.	2.65
109.	Man performs some tasks at a high physiological cost.	2.62
110.	Management is the result of technical and scientific knowledge being applied in a rational direction to achieve a particular objective.	2.62
111.	Emotional reactions can be elicited by exposure to physical objects and geometric forms.	2.54
112.	The management of natural resources is culture bound.	2.52

APPENDIX B

The Environmental Concept Q-set (ECQ)

Concept List

1. Environmental management involves the application of knowledge from many different disciplines.

2. The management of natural resources to meet the needs of successive generations demands long-range planning.

3. Social values and customs influence personal conservation behavior.

4. Policies, including natural resources policies, come about as the result of interacting social processes: science and technology, government operations, private interests and public attitudes.

5. Opportunities to experience and enjoy nature are psychologically rewarding to many and are important to mental health.

6. Individual citizens should be stimulated to become well informed about resource issues, problems, management procedures and ecological principles.

7. As populations increase and/or as resource supplies decrease, the freedom of the individual to use the resource as he wishes decreases irrespective of the form of government.

8. The renewable resource base can be extended by reproduction, growth and management.

9. Man is influenced by many of the same hereditary and environmental factors that affect other organisms and their populations.

10. Individuals tend to select short term economic gains, often at the expense of greater long term environmental benefits.

11. Man has a moral responsibility for his environmental decisions.

12. All living things, including man, are continually evolving.

13. Conservation policy is determined by the interaction of science and technology; social and political factors; and aesthetic, ethical and economic considerations.

14. Man has the ability to manipulate and change the environment.

15. Living things are interdependent with each other and their environment.

16. Choices between needs (essentials) and wants or desires (nonessentials) are often in conflict.

17. Resource depletion can be slowed by the development and adoption of alternatives.

18. Social and technological changes alter the interrelationships, importance and uses for natural resources.

19. An organism is a product of its heredity and environment.

20. Options available to future generations must not be foreclosed.

21. Modern man affects the structure of his environment.

22. The economy of a region depends on the utilization of its natural, human and cultural resources and technologies over time.

23. The natural environment is irreplaceable.

24. Environmental management has effects on individuals and social institutions.

25. Pollutants and contaminants are produced by natural and man-made processes.

26. Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government and the arts.

27. Conservation responsibilities should be shared by individuals, businesses and industries, special interest groups and all levels of government and education.

28. Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for future generations.

29. Safe waste disposal, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes and heat is important if the well-being of man and the environment is to be preserved.

30. Knowledge of the social structures, institutions, and culture of a society must be brought to bear on environmental considerations.

31. In any environment, one component like: space, water, air, or food may become a limiting factor.

32. Man's need for food, fiber and minerals increases as populations expand and levels of consumption rise.

33. Most resources are vulnerable to depletion to quantity, quality, or both.

34. The interaction of environmental and biological factors determines the size and range of species and populations.

35. There are certain risks taken, and limitations experienced, when manipulating the natural environment.

36. Organisms and environments are in constant change.

37. Increasing human populations, rising levels of living and the resultant demands for greater industrial and agricultural productivity promotes increasing environmental comtamination.

38. Economic efficiency does not always result in conservation of a natural resource.

39. Man has been a factor affecting plant and animal succession and environmental processes.

40. Increased population mobility is changing the nature of demands upon some resources.

41. The rate of change in an environment may exceed the rate of organism adaptation.

42. Man has responsibility to develop an appreciation of and respect for the rights of others.

43. Wildlife refuges, undisturbed natural areas and preserves may be of value in protecting endangered species and perpetuating the gene pool.

44. Water supplies, both in quantity and quality, are important to all levels of living.

45. The distribution or location of resources in relation to population, technology, and economic factors is critical to problems of resource conservation and use.

46. Conflicts emerge between private land use rights and the maintainence of environmental quality for the general public.

47. Man is developing the technical and sociological knowledge needed to control population growth, modify environments and alter resource use patterns.

48. The culture of a group is its learned behavior in the form of customs, habits, attitudes, institutions and lifeways that are transmitted to its progeny.

49. Natural resources are interdependent and the use or misuse of one will affect others.

50. Increasing population and per capita use of resources have brought about changed land to man or resource to population ratios.

51. As populations increase, competition for the use of water increases, resulting in a need for establishing water use priorities.

52. We have "legal" ownership of some resources, like real estate, and control over others during our lifetime, but ethically we are "stewards" rather than owners of the resource base.

53. Green plants are the ultimate sources of food, clothing, shelter and energy in most societies.

54. A knowledge of the social, physical and biological sciences, and humanities are important for environmental understanding.

APPENDIX C

The Information Sheet

INFORMATION SHEET

Please check the appropriate boxes.

A. Gender: ☐ female ☐ male

B. Age ☐ 18-26 years ☐ 45-53 years
☐ 27-35 years ☐ 54-62 years
☐ 36-44 years ☐ 63 years or older

C. Education ☐ High School ☐ Master's
☐ Two Year School ☐ Doctorate
☐ Bachelor's ☐ Other (Please Describe)

D. College Education (circle one) yes no

Undergrad Major(s) _____ _____

Minor(s) _____ _____

Graduate or Professional School

Major(s) _____ _____

Minor(s) _____ _____

E. How many persons, including yourself, are there in your household? (Please include children away at school)

(circle one)
Number of persons 1 2 3 4 5 6 7 8

more than 8

F. Do you or any members of your household now own, lease or operate a car? Please consider other vehicles (Jeeps, pickups, etc.) to be "cars". (circle one) Yes no

(circle one)
Number of cars owned or leased 0 1 2 3 4 5

more than 5

G. Do you own or rent your home or apartment?

☐ Own Home ☐ Own Apartment
☐ Rent Home ☐ Rent Apartment

H. Please indicate the population of the county in which you live?

☐ Less than 35,000
☐ 35,000-150,000
☐ 150,000-1.5 Million
☐ More than 1.5 Million

I. How many hours of television did you watch in the past week?

☐ 0-4 hours ☐ 13-16 hours
☐ 5-8 hours ☐ 17-20 hours
☐ 9-12 hours ☐ More than 20 hours

J. How often do you watch a Public broadcasting System (PBS) channel?

☐ Often ☐ Never
☐ Occasionally

K. Check the publications you read regularly. (Over half the issues in the past year).

☐ Audubon ☐ National Geographic
☐ Field&Stream ☐ U.S. News and World Report
☐ Newsweek ☐ Scientific American
☐ Time ☐ Wall Street Journal
☐ Smithsonian ☐ Journal of Environmental Education

L. Please check any of the following you have done in the past 12 months.

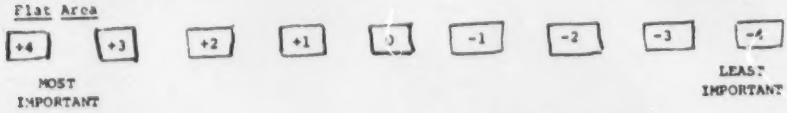
☐ Voted in an election
☐ Wrote to the editor of a magazine, newspaper, radio, or TV station
☐ Gave a speech or addressed a public meeting on an environmentally-related topic.
☐ Took active part in a civic or social issue
☐ Wrote to a Congressperson or other elected official about an environmental issue.
☐ Wrote something for publication in a popular magazine or professional journal.
☐ Alone, or in a group, visited representative(s) of an institution, government body, civic group or corporation to make known your point of view on an environmental issue.
☐ Joined or continued membership in an environmental or consumer group
☐ Made a contribution to or worked for an environmental or consumer group

APPENDIX D

Sorting Instructions for the Environmental Concept Q-set (ECQ)

INSTRUCTIONS FOR USING THE
COMPUTER CARDS AND SMALL ENVELOPES

To use these computer cards and envelopes, you will need a flat area like a desk or a table. First, spread the envelopes across the flat area with the envelope marked +4 on the far left and with the envelope marked -4 on the far right. The other envelopes will be spread in the middle. When you are done, your envelopes will be placed as pictured here:



On each card is a statement of a concept. As you follow the instructions, you will be sorting the cards in terms of how important you think each concept is. The thought to keep in your mind at all times is: "What should a student know about the environment?"

DO NOT READ ALL OF THE INSTRUCTIONS NOW. PLEASE FOLLOW THEM ONE STEP AT A TIME.

STEP 1. Read quickly through all of the cards to get a feeling for what they say. You do not have to keep the cards in order.

STEP 2. Sort the cards into three (3) nearly equal piles so that:
(a) those cards on your left are the cards which you believe are MOST IMPORTANT;
(b) those cards on your right are the cards which you believe are LEAST IMPORTANT; and
(c) those cards in the middle are the cards which you do not feel so strongly about.
Dividing the cards this way means only that you like some cards more than you do others.

STEP 3. Spread the cards in the left-hand pile so that you can read them easily. Choose six (6) cards which you believe are the MOST IMPORTANT of all and place them on the +4 envelope.

STEP 4. Spread the cards in the right-hand pile so that you can read them easily. Choose six (6) cards which you believe are the LEAST IMPORTANT of all and place them on the -4 envelope.

STEP 5. Go to the left-hand pile and choose six (6) cards which are the next MOST IMPORTANT. Place them on the +3 envelope.

STEP 6. Go to the right-hand pile and choose six (6) cards which are the next LEAST IMPORTANT. Place them on the -3 envelope.

Note: IF AT ANY TIME YOU CHANGE YOUR MIND ABOUT A CARD YOU HAVE PLACED IN A PILE, FEEL FREE TO CHANGE IT TO ANOTHER PILE.

STEP 7. Go to the left-hand pile and choose six (6) cards to place on the +2 envelope. You may have to take cards from the middle pile in order to have enough.

STEP 8. Go to the right-hand pile and choose six (6) cards to place on the -2 envelope. You may have to take cards from the middle pile in order to have enough.

STEP 9. Go to the left-hand pile and choose six (6) cards to place on the +1 envelope. Again it is alright to take cards from the middle pile.

STEP 10. Go to the right-hand pile and choose six (6) cards to place on the -1 envelope. Again it is alright to take cards from the middle pile.

STEP 11. You should now have six (6) cards left over. Place these on the envelope marked 0.

STEP 12. Read back over each pile, starting on the left-hand side, to make sure that you have placed the cards where you really wanted them. If you change any of the cards around, please make sure there are six (6) cards in each pile when you finish.

STEP 13. Please place the cards in their envelopes: for example, the six (6) MOST IMPORTANT cards go in the +4 envelope. Please fold the flaps in to hold the cards in place.

STEP 14. Please place the small envelopes and the INFORMATION SHEET into the stamped, self addressed envelope and mail it immediately.

THANK YOU AGAIN FOR YOUR COOPERATION

APPENDIX E

Waiver of Human Subjects Consent Form

OHIO STATE UNIVERSITY
BEHAVIORAL & SOCIAL SCIENCES
HUMAN SUBJECT REVIEW COMMITTEE
RESEARCH INVOLVING HUMAN SUBJECTS

PROTOCOL NO. 80B 098
ORIGINAL REVIEW X
CONTINUING REVIEW
FIVE-YEAR REVIEW

ACTION OF THE REVIEW COMMITTEE

The Behavioral and Social Sciences Review Committee has taken the following action:

XX 1. Approve (XX Waiver of written consent)

2. Approved with conditions

3. Disapprove

with regard to the employment of human subjects in the proposed research entitled: THE TAXONOMIC STRUCTURE OF THE DOMAIN OF ENVIRONMENTAL EDUCATION CONCEPTS.

Robert D. Townsend
Robert E. Roth/ is listed as the principal investigator.
246 Lord Hall
124 W 17th Ave.
Campus

It is the responsibility of the principal investigator to retain a copy of each signed consent form for at least four (4) years beyond the termination of the subject's participation in the proposed activity. Should the principal investigator leave the University, signed consent forms are to be transferred to the Human Subject Review Committee for the required retention period. This application has been approved for the period of one year. You are reminded that you must promptly report any problems to the Research Committee, and that no procedural changes may be made without prior review and approval. You are also reminded that the identity of the research participants must be kept confidential.

Date: 3-7-80 Signed: P D Drake
(Chairperson)

cc: Original-Investigator
Ken Sloan
Development Officer
File

Form PA-025
Rev. 10/79

APPENDIX F

Form Letter Mailed to Individuals in the Study

OSU

The Ohio State University

Division of
Environmental Education
124 West 17th Avenue
Columbus, Ohio 43210
Phone 614 422-5589

April 4, 1980

Concerns about the environment have generated much interest in environmental education. As a consequence, many attempts have been made to develop educational programs. A necessary first consideration in the development of such programs must be: What concepts are essential to environmental education programs, or What should a student know about the environment?

Previous studies, committees, and state and federal agencies have identified concepts for use in programs of instruction. Using some of these concepts, we are investigating the taxonomic structure of the domain of environmental education concepts. It is an effort to achieve an empirical understanding of the structure of the concepts and to determine what relationships exist between the concepts and selected variables. We need your help.

We are asking that you do two things with the materials in the packet which you received. It will take about 30 to 45 minutes of your time.

1. Please complete the INFORMATION SHEET. Do not put your name on it. We want the information to be confidential.

2. Follow the step by step INSTRUCTIONS FOR USING THE COMPUTER CARDS AND SMALL ENVELOPES.

When you finish, please return the materials to us by mail. Use the stamped, self-addressed envelope. Please send your completed materials by April 25, 1980 or as soon as possible. If you have any questions, please do not hesitate to call Mr. Townsend at 614-422-6717 during the day or 614-291-5677 during the evening hours.

To insure confidentiality of the responses, only group data will be reported. The identification numbers keypunched on each computer card identify the concepts and insure the completeness of the sample.

A final note: We realize the concept list does not include energy concepts. Another study at Ohio State is investigating that domain.

Thank you for your cooperation and for generously giving of your time.

Cordially yours,

Robert E. Roth, Chairman
Division of Environmental Education

Robert D. Townsend
Principal Investigator

School of Natural Resources

OSU

The Ohio State University

Division of
Environmental Education
124 West 17th Avenue
Columbus, Ohio 43210
Phone 614 422-5589

April 4, 1980

Concerns about the environment have generated much interest in environmental education. As a consequence, many attempts have been made to develop educational programs. A necessary first consideration in the development of such programs must be: What concepts are essential to environmental education programs, or What should a student know about the environment?

Previous studies, committees, and state and federal agencies have identified concepts for use in programs of instruction. Using some of these concepts, we are investigating the taxonomic structure of the domain of environmental education concepts. It is an effort to achieve an empirical understanding of the structure of the concepts and to determine what relationships exist between the concepts and selected variables. We need your help. In order to develop a balanced viewpoint, we feel it is important to get the opinions of persons such as yourself in environmentally-concerned organizations as well as those of environmental educators.

We are asking that you do two things with the materials in the packet which you received. It will take about 30 to 45 minutes of your time.

1. Please complete the INFORMATION SHEET. Do not put your name on it. We want the information to be confidential.

2. Follow the step by step INSTRUCTIONS FOR USING THE COMPUTER CARDS AND SMALL ENVELOPES.

When you finish, please return the materials to us by mail. Use the stamped, self-addressed envelope. Please send your completed materials by April 25, 1980 or as soon as possible. If you have any questions, please do not hesitate to call Mr. Townsend at 614-422-6717 during the day or 614-291-5677 during the evening hours.

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A final note: We realize the concept list does not include energy concepts. Another study at Ohio State is investigating that domain.

Thank you for your cooperation and for generously giving of your time.

Cordially yours,

Robert E. Roth, Chairman
Division of Environmental Education

Robert D. Townsend
Principal Investigator

School of Natural Resources

APPENDIX G

Fortran Punch Program for Data Organization

FORTRAN Cardpunch Program

```
   DIMENSION GROUP(54),SUBJ(54),RATE(54)
   DO 40 J=I,3
   READ 1,REGION
 1 FORMAT(I1)
   DO 5 I=1,54
   READ 10,GROUP(I),SUBJ(I),RATE(I)
10 FORMAT(2X,I1,A3,A2)
 5 CONTINUE
   PRINT 20,REGION,GROUP(I),SUBJ(I),(RATE(I),I=1,20),REGION
  1GROUP(I),SUBJ(I),(RATE(I),I=21,54)
20 FORMAT(1X,'I',I1,I1,A3,34X20A2,/1X,'2',I1,I1,A3,34A2)
   PUNCH 30,REGION,GROUP(I),SUBJ(I),(RATE(I),I=1,20),REGION,
  1GROUP(I),SUBJ(I),(RATE(I),I=21,54)
30 FORMAT('I',I1,I1,A3,34X,20A2,/,'2',I1,I1,A3,34A2)
40 CONTINUE
   STOP
   END
```

APPENDIX H

Geographic Regions Used in the Study

New England	Mideast	Great Lakes	Southeast	Plains	Rocky Mountains	Southwest	Farwest
Connecticut	Delaware	Illinois	Alabama	Iowa	Colorado	Arizona	Alaska
Maine	Dist. Columbia	Indiana	Arkansas	Kansas	Idaho	New Mexico	California
Massachusetts	Maryland	Michigan	Florida	Minnesota	Montana	Oklahoma	Hawaii
New Hampshire	New Jersey	Ohio	Georgia	Missouri	Utah	Texas	Nevada
Rhode Island	New York	Wisconsin	Kentucky	Nebraska	Wyoming		Oregon
Vermont	Pennsylvania		Louisiana	North Dakota			Washington
			Mississippi	South Dakota			
			North Carolina				
			South Carolina				
			Tennessee				
			West Virginia				
			Virginia				

State Groupings (Geographic Regions) Used in the Study.

*Includes Alaska and Hawaii

APPENDIX I

Materials Used to Increase Response Rate

OSU

The Ohio State University

Division of
Environmental Education
124 West 17th Avenue
Columbus, Ohio 43210
Phone 614 422-5589

April 28, 1980

Several weeks ago you were sent a request to participate in a national study investigating the taxonomic structure of the domain of environmental education concepts. The materials included fifty-four(54) computer cards with a different educational concept printed on the reverse side of each card.

Response to date has been good, however, a check of our records indicates that we have not received a response from you. For your information, printed on the back of this letter is a map of the United States illustrating the location of the participants selected for this study and their response or non-response status.

We would appreciate very much your input into this study. We realize you are being asked to make some difficult decisions about the relative importance of selected concepts in environmental education. All of the concepts identified for this study are important and it is a difficult task to sort them. By doing so, however, you will be making a significant contribution to environmental education.

Please complete the Information Sheet and carefully follow the Instructions for Using the Computer Cards and Small Envelopes. A stamped, self-addressed envelope was provided for your convenience. If you have already returned the materials, please accept our thanks for your participation. If not, please complete and return the materials as soon as possible, or by May 12, 1980.

Thank you for your cooperation on this project. For your time and effort, each respondant will be sent a complementary copy of the research report.

Sincerely,

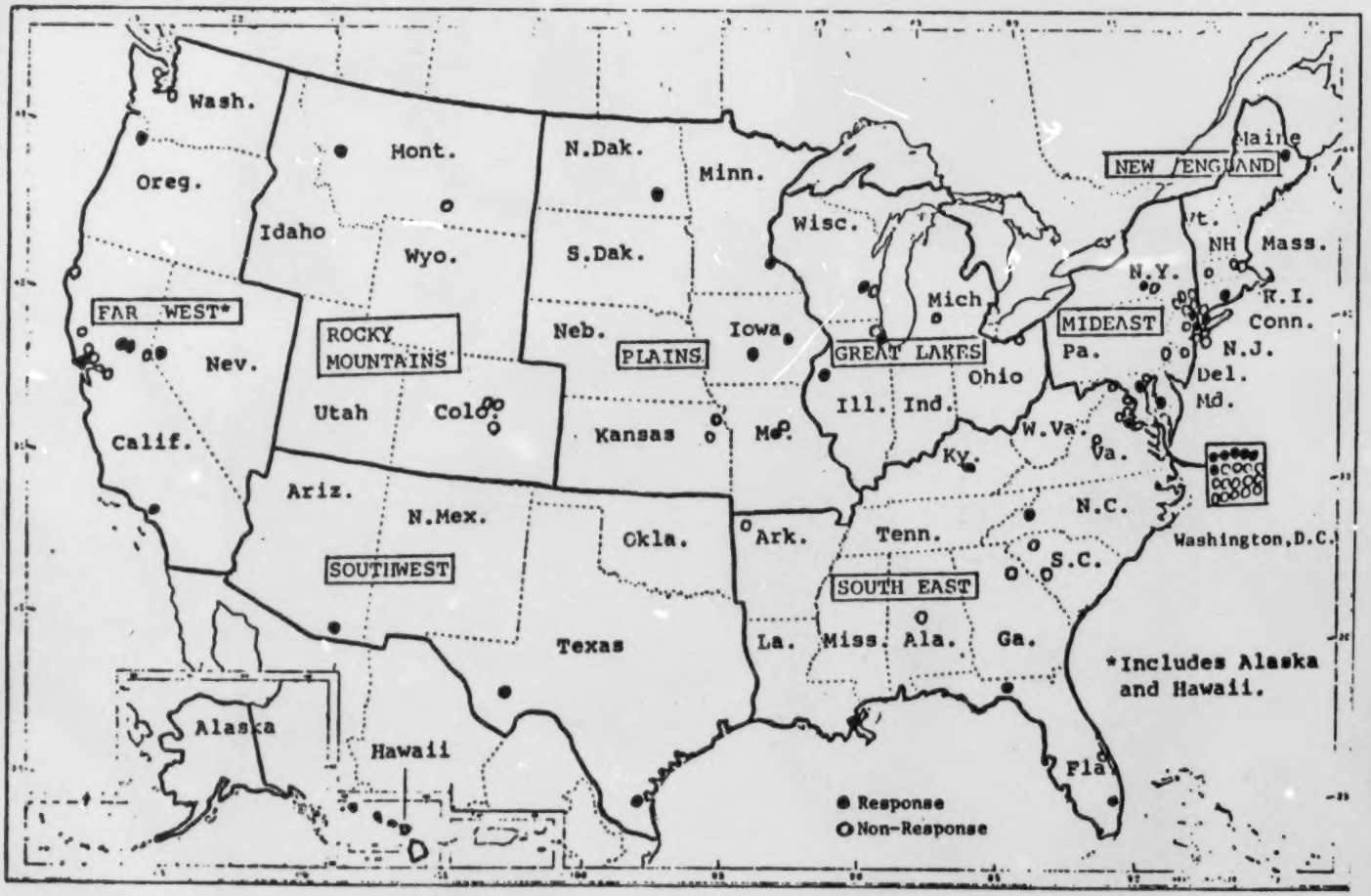
Robert D. Townsend, Research Associate
School of Natural Resources
Division of Environmental Education

School of Natural Resources

UNITED STATES

Location of Organizations Surveyed

4/25/80



OSU

The Ohio State University

Division of
Environmental Education
124 West 17th Avenue
Columbus, Ohio 43210
Phone 614 422-55[illegible]

April 28, 1980

Several weeks ago you were sent a request to participate in a national study investigating the taxonomic structure of the domain of environmental education concepts. The materials included fifty-four(54) computer cards with a different educational concept printed on the reverse side of each card.

Response to date has been good, however, a check of our records indicates that we have not received a response from you. For your information, printed on the back of this letter is a map of the United States illustrating the location of the participants selected for this study and their response or non-response status.

We would appreciate very much your input into this study. We realize you are being asked to make some difficult decisions about the relative importance of selected concepts in environmental education. All of the concepts identified for this study are important and it is a difficult task to sort them. By doing so, however, you will be making a significant contribution to environmental education.

Please complete the Information Sheet and carefully follow the Instructions for Using the Computer Cards and Small Envelopes. A stamped, self-addressed envelope was provided for your convenience. If you have already returned the materials, please accept our thanks for your participation. If not, please complete and return the materials as soon as possible, or by May 12, 1980.

Thank you for your cooperation on this project. For your time and effort, each respondant will be sent a complementary copy of the research report.

Sincerely,

Robert D. Townsend

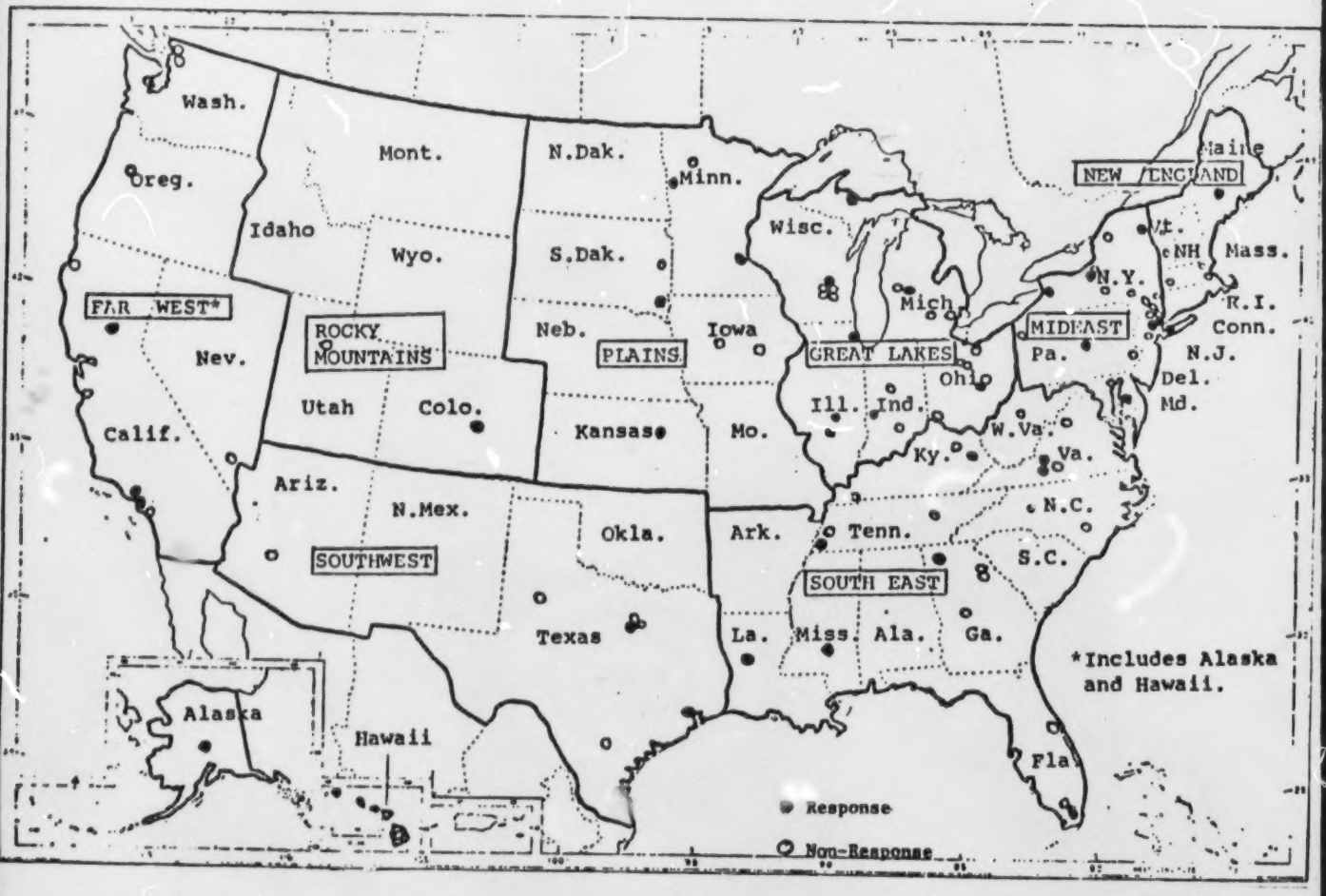
Robert D. Townsend, Research Associate
School of Natural Resources
Division of Environmental Education

School of Natural Resources

UNITED STATES

Location of Individuals Surveyed

4/25/80



OSU

The Ohio State University

Division of
Environmental Education
124 West 17th Avenue
Columbus, Ohio 43210
Phone 614 422-5589

May 19, 1980

Six weeks ago you were sent a request to participate in a national study investigating the taxonomic structure of the domain of environmental education concepts.

Response to date has been good, however, a check of our records indicates that we have not received a response from you. A frequent criticism of educational research is that it does not include input from those outside the "ivory tower" of higher education. We've tried to remedy that situation by coming to people like yourself who represent organizations with a concern about the environment. Here is your opportunity to make a significant contribution. Are you going to let it slip away?

Please complete the Information Sheet and carefully follow the Instructions for Using the Computer Cards and Small Envelopes. A stamped, self-addressed envelope was provided for your convenience. If you did not receive or have misplaced the materials, please contact me at (614) 422-5589. If you have already returned the materials, please accept our thanks for your participation. If not, please complete and return the materials as soon as possible, or by June 2, 1980.

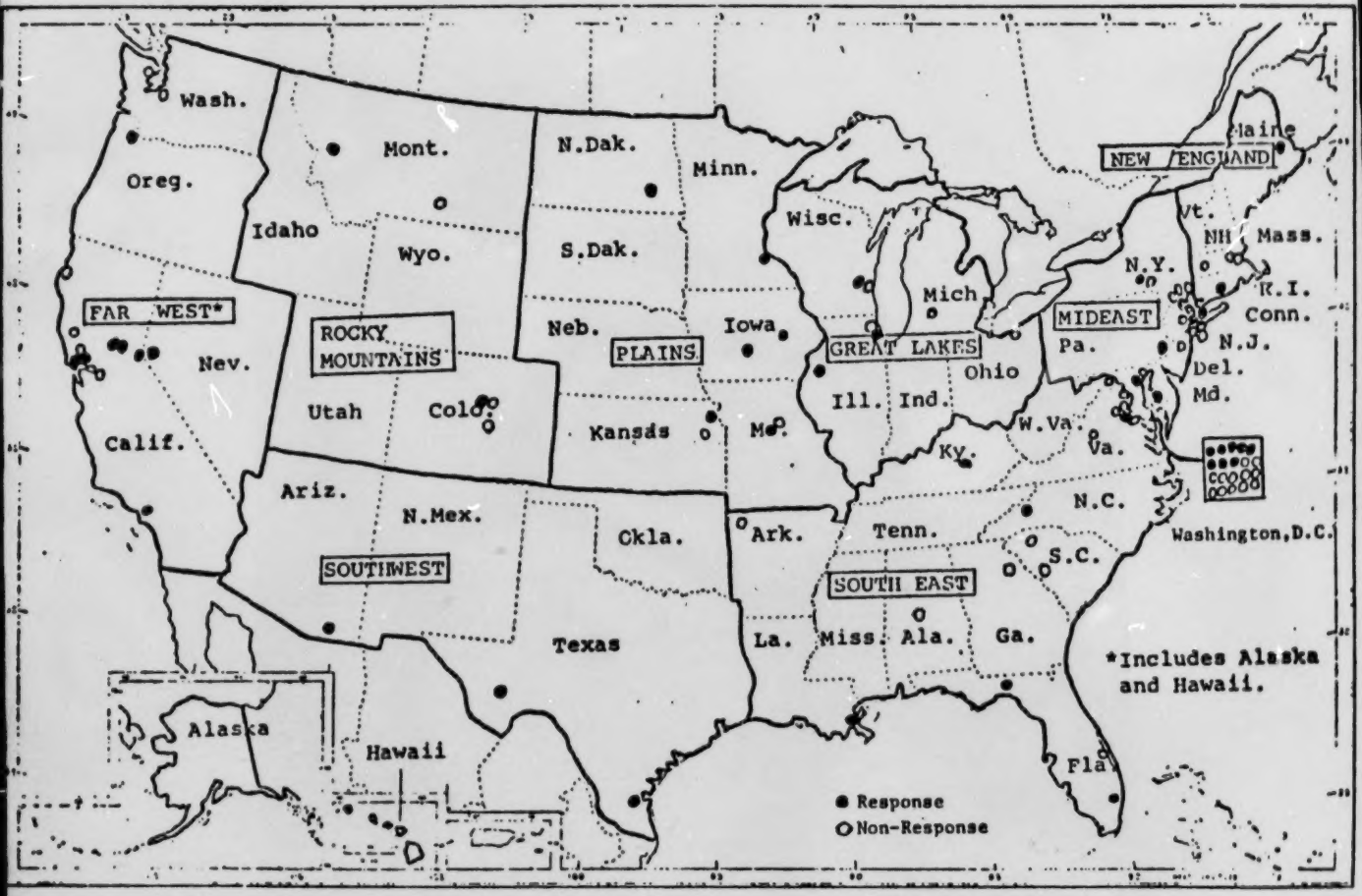
Thank you for your cooperation on this project. For your time and effort, each respondant will be sent a complementary copy of the research report.

Sincerely,

Robert D. Townsend, Research Associate
School of Natural Resources
Division of Environmental Education

UNITED STATES

Location of Organizations Surveyed 5/16/80



OH GREAT. GEE WHIZ. TODAY WE'RE GOING TO LEARN ABOUT THE ENVIRONMENT.
I'M SORRY CLASS. WE CAN'T STUDY THE ENVIRONMENT TODAY SINCE WE HAVEN'T HEARD FROM CONCERNING WHAT'S IMPORTANT TO LEARN.

OSU

The Ohio State University

Division of
Environmental Education
124 West 17th Avenue
Columbus, Ohio 43210
Phone 614 422-5589

June 26, 1980

Almost three months ago you were sent a request to participate in a national study investigating the taxonomic structure of the domain of environmental education concepts. To date we have not received a response from you.

In order to complete the project and more accurately interpret the information we have obtained, we are asking you to take a few minutes and complete the enclosed questionnaire. A stamped, self-addressed return envelope is provided for your convenience.

Please complete the information sheet as soon as possible and return it by July 15, 1980.

Thank you for your cooperation.

Sincerely,

Robert D. Townsend, Research Associate
School of Natural Resources
Division of Environmental Education

APPENDIX J

Factor Analysis Results

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	SKEWNESS	KURTOSIS	SMALLEST VALUE	LARGEST VALUE	SMALLEST STD SCORE	LARGEST STD SCORE
1	GROUP	1.4538	0.5000	0.3439	0.1833	-1.9828	1.0000	2.0000	-0.9076	1.0925
2	SEX	1.7983	0.4030	0.2241	-1.4682	0.1572	1.0000	2.0000	-1.9811	0.5006
3	AGE	3.4790	1.3583	0.3904	0.1647	-0.8644	1.0000	6.0000	-1.6251	1.8561
4	EDUCATON	4.3529	1.0134	0.2328	-1.6597	2.6239	1.0000	6.0000	-3.3087	1.6234
5	CLLGEDN	0.4580	0.2015	0.2103	-4.5081	18.4783	0.0	1.0000	-4.7548	0.4086
6	PEOPLE	3.0840	1.4762	0.4787	0.8284	1.1553	1.0000	9.0000	-1.4117	4.0075
7	CARS	0.9832	0.1291	0.1313	-7.4232	53.5540	0.0	1.0000	-7.6163	0.1302
8	NMBRCARS	2.0672	0.9364	0.4530	0.7277	0.7828	0.0	5.0000	-2.2077	3.1321
9	HOUSING	1.1848	0.3898	0.3290	1.6031	0.5751	1.0000	2.0000	-0.4744	2.0910
10	COUNTY	2.4453	0.7778	0.3181	-0.0876	-0.4726	1.0000	4.0000	-1.8582	1.9987
11	TYMRS	2.0000	1.1717	0.5859	1.2851	0.8789	1.0000	5.0000	-0.8534	2.5604
12	PBS	2.3109	0.6071	0.2627	-0.4684	-0.6776	1.0000	3.0000	-2.1592	1.1350
13	AUDUBON	0.3613	0.4824	1.3351	0.5700	-1.6891	0.0	1.0000	-0.7490	1.3239
14	FIELDSTN	0.0840	0.2786	3.3155	2.9609	6.8245	0.0	1.0000	-0.3016	3.2876
15	NEWSWEEK	0.2521	0.4361	1.7297	1.1275	-0.7348	0.0	1.0000	-0.5781	1.7154
16	TIME	0.3109	0.4648	1.4950	0.8067	-1.3604	0.0	1.0000	-0.6889	1.4824
17	SMITHSAN	0.2689	0.4453	1.6558	1.0293	-0.9483	0.0	1.0000	-0.6039	1.6419
18	NTLGEUG	0.5294	0.5012	0.9468	-0.1164	-2.0031	0.0	1.0000	-1.0562	0.9388
19	USNEWSWR	0.1597	0.3678	2.3039	1.8349	1.3786	0.0	1.0000	-0.4341	2.2845
20	SCIAMRCN	0.2437	0.4311	1.7691	1.1790	-0.6149	0.0	1.0000	-0.5653	1.7543
21	WALLST JL	0.1176	0.3230	2.7502	2.3436	3.5223	0.0	1.0000	-0.3638	2.7471
22	JRENVEON	0.3301	0.4744	1.4113	0.6851	-1.5434	0.0	1.0000	-0.7086	1.3994
23	CURINV1	0.7647	0.4260	0.5570	-1.2324	-0.4851	0.0	1.0000	-1.7932	0.5529
24	CURINV2	0.3866	0.4890	1.2651	0.4601	-1.8033	0.0	1.0000	-0.7905	1.2545
25	CURINV3	0.8067	0.3963	0.4913	-1.5340	0.3564	0.0	1.0000	-2.0349	0.4874
26	CURINV4	0.5462	0.5000	0.9153	-0.1833	-1.9828	0.0	1.0000	-1.0925	0.9076
27	CURINV5	0.4538	0.5000	1.1018	0.1833	-1.9828	0.0	1.0000	-0.9076	1.0925
28	CURINV6	0.6723	0.4714	0.7012	-0.7248	-1.4869	0.0	1.0000	-1.4262	0.6953
29	CURINV7	0.3781	0.4870	1.2878	0.4962	-1.7684	0.0	1.0000	-0.7765	1.2770
30	CURINV8	0.8403	0.3678	0.4377	-1.8349	1.3786	0.0	1.0000	-2.2845	0.4341
31	CURINV9	0.6723	0.4714	0.7012	-0.7248	-1.4869	0.0	1.0000	-1.4262	0.6953
32	FACTOR5	0.0034	1.0023	185.5329	-0.0146	0.0544	-2.8320	2.0230	-2.8303	2.0160
33	FACTOR1	0.0152	0.9902	65.1676	0.2278	-0.7413	-1.7600	2.0790	-1.7928	2.0843
34	FACTOR2	0.0082	1.0002	122.2164	0.2640	-0.3564	-2.0650	2.9170	-2.0728	2.9083
35	FACTOR3	-0.0021	1.0040	-483.6882	-0.1783	-0.3747	-2.4720	2.1150	-2.4602	2.1087
36	FACTOR4	0.0175	0.9859	56.4530	-0.1917	-0.6063	-2.4200	2.0430	-2.4724	2.0946

NOTE - KURTOSIS VALUES GREATER THAN ZERO INDICATE A DISTRIBUTION WITH HEAVIER TAILS THAN NORMAL DISTRIBUTION

CORRELATION MATRIX

		GROUP 1	SEX 2	AGE 3	EDUCATON 4	CLLGEDN 5	PEOPLE 6	CARS 7	NMBRCARS 8	HOUSING 9	COUNTY 10
GROUP	1	1.0000									
SEX	2	-0.0046	1.0000								
AGE	3	0.1015	0.1935	1.0000							
EDUCATON	4	-0.4860	0.2380	0.0547	1.0000						
CLLGEDN	5	-0.2298	0.1035	-0.0807	0.6959	1.0000					
PEOPLE	6	-0.0751	0.1712	0.0558	0.1216	-0.0450	1.0000				
CARS	7	-0.1434	0.2601	0.0463	0.1105	-0.0274	0.1854	1.0000			
NMBRCARS	8	-0.0295	0.0587	0.1810	0.0284	-0.0298	0.4863	0.2899	1.0000		
HOUSING	9	0.0877	-0.0843	-0.3927	-0.1451	0.0997	-0.2628	-0.1061	-0.1968	1.0000	
COUNTY	10	0.0861	-0.0695	0.0932	-0.1474	-0.0418	-0.0550	-0.1780	-0.0415	-0.0223	1.0000
TVHRS	11	0.0434	0.0180	0.0959	-0.1285	-0.1795	-0.0147	0.0560	-0.0695	-0.0371	0.0744
PBS	12	-0.0500	0.0853	0.1878	-0.0146	-0.0309	0.0557	0.0672	0.1120	-0.1017	0.1350
AUDUBON	13	0.1928	-0.0143	0.0958	-0.0897	0.0703	-0.0787	-0.1738	0.0959	-0.0428	0.0869
FIELDSTM	14	0.2715	0.0013	-0.0401	-0.1960	-0.0875	0.0651	0.0396	0.1081	-0.0662	0.0214
NEWSWEEK	15	-0.1016	-0.0940	-0.0482	-0.0496	0.0251	0.0985	-0.0746	-0.0626	-0.0272	0.0409
TIME	16	-0.1747	-0.0696	0.0306	0.0889	0.1407	0.0480	0.0878	0.0100	0.0075	-0.0347
SMITHSAN	17	0.1705	-0.1203	0.1776	0.0696	0.1270	-0.0862	-0.0681	0.0173	-0.0447	0.0428
NTLGEOG	18	-0.0199	0.0296	0.1098	-0.0707	-0.1975	-0.0263	-0.1233	0.0499	-0.0714	0.0639
USNEWSWR	19	0.0174	-0.0668	0.1679	-0.1525	-0.0231	-0.0405	-0.1215	-0.1791	0.0879	0.1048
SCIAMRCN	20	-0.1242	-0.1050	0.1174	0.0342	0.0213	0.0474	0.0742	0.1900	-0.1191	0.0527
WALLSTJL	21	0.0863	-0.0115	0.0635	-0.1794	0.0765	-0.0031	-0.1552	0.0296	-0.0395	0.2278
JRENVEDN	22	-0.3985	-0.0414	-0.0810	0.2624	0.1490	0.0198	-0.0454	0.0632	-0.0181	-0.1795
CURINV1	23	-0.2107	0.1162	0.2697	0.2333	0.0813	0.0721	-0.0725	0.0825	-0.2492	-0.0647
CURINV2	24	0.2123	0.0979	0.0761	-0.0724	-0.0918	0.0251	-0.0305	0.0538	0.0220	-0.0109
CURINV3	25	0.0614	0.1252	0.0317	0.1290	0.0036	0.1148	-0.0640	0.0353	-0.0410	-0.1032
CURINV4	26	0.0171	0.1308	0.0106	0.0512	-0.0226	-0.0972	0.0121	0.0114	0.0862	-0.0207
CURINV5	27	0.1863	-0.0046	0.1265	-0.1348	-0.1456	-0.0751	-0.1434	0.1515	-0.1297	0.0207
CURINV6	28	-0.1188	0.0952	0.0222	0.2797	0.1215	0.1130	0.0480	-0.0073	-0.0826	-0.1533
CURINV7	29	0.1942	0.0465	-0.0327	0.0020	-0.0094	0.0379	-0.0329	0.0739	0.1197	-0.1799
CURINV8	30	0.1208	0.0096	0.1035	0.0388	0.0231	-0.0999	-0.0570	0.1544	-0.0288	-0.0752
CURINV9	31	0.0251	-0.1725	-0.0572	-0.1816	-0.1462	-0.2280	-0.0913	0.0311	0.0558	-0.0839
FACTOR	32	-0.0113	0.1219	0.0277	0.0344	0.0882	-0.0789	0.0889	0.0971	-0.0446	0.1016
FACTOR1	33	0.0064	0.0531	-0.1038	-0.0272	-0.1257	-0.0110	0.0231	0.0275	0.0166	-0.1290
FACTOR2	34	-0.2384	0.0980	-0.0252	0.1372	0.1543	0.0839	0.1135	0.0556	0.0271	-0.0841
FACTOR3	35	-0.0059	-0.0129	-0.0118	-0.0896	-0.0536	-0.0817	0.0293	0.1277	0.0102	0.0990
FACTOR4	36	0.2468	-0.0939	0.1330	-0.2600	-0.1939	-0.0282	-0.0942	0.0250	-0.0040	0.0843

		TVHRS 11	PBS 12	AUDUBON 13	FIELDSTM 14	NEWSWEEK 15	TIME 16	SMITHSAN 17	NTLGEOG 18	USNEWSWR 19	SCIAMRCN 20
TVHRS	11	1.0000									
PBS	12	0.0357	1.0000								
AUDUBON	13	-0.1049	0.0761	1.0000							
FIELDSTM	14	-0.0260	-0.1558	0.0874	1.0000						
NEWSWEEK	15	-0.0332	0.0215	0.0064	-0.1061	1.0000					
TIME	16	-0.0311	-0.1653	0.0238	-0.0726	-0.0555	1.0000				
SMITHSAN	17	-0.1462	0.1270	0.1356	0.1579	0.0407	0.1249	1.0000			
NTLGEOG	18	0.0289	0.0950	0.0783	0.1642	0.1597	-0.0578	0.0782	1.0000		
USNEWSWR	19	-0.1573	0.0794	-0.0413	0.0334	0.0639	-0.0450	-0.0574	0.0433	1.0000	
SCIAMRCN	20	-0.0839	-0.0006	0.1842	-0.0308	0.2565	0.1684	0.2738	0.1822	-0.0337	1.0000
WALLSTJL	21	-0.0671	0.0711	0.0511	0.0774	0.1484	0.0928	-0.0450	-0.1260	0.3393	0.0357
JRENVEDN	22	-0.1677	0.0754	0.0202	-0.1514	-0.0034	0.1754	0.1301	-0.0063	0.0784	0.0933
CURINV1	23	-0.0340	-0.0096	0.0461	0.0252	-0.0429	0.0730	0.0683	0.2708	0.1336	0.1764
CURINV2	24	-0.0296	-0.0657	0.1932	-0.0538	-0.0237	-0.0113	0.0245	0.0569	0.0780	0.0719
CURINV3	25	-0.1094	-0.0651	0.2353	-0.0819	-0.0589	-0.0390	0.0569	0.0075	-0.0771	0.0796
CURINV4	26	0.0434	-0.0059	0.1586	-0.0890	0.0238	-0.0441	-0.1324	0.0537	-0.0635	0.2029
CURINV5	27	-0.0145	0.0617	0.2279	-0.0327	0.0539	-0.0288	-0.0198	0.2506	0.1096	0.1903
CURINV6	28	-0.0921	0.0333	-0.0711	-0.1112	-0.1306	0.1209	0.0197	-0.0844	0.0111	-0.0624
CURINV7	29	-0.0743	-0.0857	0.0627	0.0761	0.0661	-0.0746	-0.0821	0.0408	0.0859	0.1225
CURINV8	30	0.0787	-0.0035	0.2801	0.1320	-0.0111	-0.0046	0.1091	0.0946	-0.1232	0.1406
CURINV9	31	0.0767	-0.0259	0.2643	-0.0466	0.0755	-0.0338	-0.0207	0.1308	-0.0867	0.1878
FACTOR5	32	0.0169	-0.0310	0.0562	-0.0320	-0.1712	0.0922	-0.1537	-0.0282	-0.1722	0.0847
FACTOR1	33	0.0033	-0.0075	-0.0443	-0.0742	-0.0918	-0.0699	-0.0648	-0.0777	-0.0731	-0.1659
FACTOR2	34	-0.0889	0.0479	-0.1914	-0.1121	0.2269	0.0512	0.0206	0.0158	0.0090	-0.0158
FACTOR3	35	-0.0196	0.2139	0.1308	0.0503	0.0761	-0.1190	0.0707	0.0880	-0.1163	0.0836
FACTOR4	36	0.0220	-0.0690	0.0813	0.1957	0.0690	-0.2527	-0.0663	-0.0648	0.1961	-0.1614

		WALLSTJL 21	JRENVEDN 22	CURINV1 23	CURINV2 24	CURINV3 25	CURINV4 26	CURINV5 27	CURINV6 28	CURINV7 29	CURINV8 30
WALLSTJL	21	1.0000									
JRENVEDN	22	0.0715	1.0000								
CURINV1	23	0.0181	0.1431	1.0000							
CURINV2	24	-0.0756	-0.0534	0.0742	1.0000						
CURINV3	25	-0.0855	0.1230	0.0797	0.2574	1.0000					
CURINV4	26	0.0185	0.0054	0.2505	0.3769	0.1951	1.0000				
CURINV5	27	-0.0709	-0.1483	0.1873	0.4203	0.1897	0.3222	1.0000			
CURINV6	28	-0.1340	-0.1557	0.1614	0.2234	0.2477	0.0828	0.0251	1.0000		
CURINV7	29	-0.0696	-0.0780	0.1874	0.3062	0.2939	0.3279	0.3683	0.1384	1.0000	
CURINV8	30	0.0166	0.1159	-0.0255	0.1105	0.3676	0.2017	0.1669	0.0867	0.0087	1.0000
CURINV9	31	0.0327	0.0420	0.1192	0.1498	0.2023	0.3345	0.2768	0.0083	0.4122	0.4288
FACTOR5	32	0.0249	-0.1333	-0.1649	0.0589	-0.0921	-0.0111	0.0224	-0.0096	-0.1876	0.0962
FACTOR1	33	-0.0606	0.0323	-0.0959	-0.0048	0.1852	0.0686	-0.0421	0.2170	0.1186	0.0410
FACTOR2	34	0.0051	0.2017	-0.0116	0.0193	-0.1258	-0.0830	-0.0768	-0.0657	-0.1192	-0.0892
FACTOR3	35	0.0720	0.0463	0.0084	0.0575	0.0807	0.1664	0.0799	0.0199	0.0743	0.0427
FACTOR4	36	-0.0096	-0.2928	-0.0733	-0.0603	-0.2176	-0.0786	0.0310	-0.1639	-0.0102	-0.1245

		CURINV9 31	FACTOR5 32	FACTOR1 33	FACTOR2 34	FACTOR3 35	FACTOR4 36
CURINV9	31	1.0000					
FACTOR5	32	-0.0684	1.0000				
FACTOR1	33	-0.0172	-0.0099	1.0000			
FACTOR2	34	-0.0056	-0.0053	-0.0151	1.0000		
FACTOR3	35	0.0460	0.0013	0.0038	0.0021	1.0000	
FACTOR4	36	-0.0704	-0.0114	-0.0328	-0.0174	0.0044	1.0000

APPENDIX K

Multiple Regression Summary Statistics

UNIVARIATE SUMMARY STATISTICS

VARIABLE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	SMALLEST VALUE	SMALLEST STANDARD SCORE	FIRST CASE FOR SMALLEST	LARGEST VALUE	LARGEST STANDARD SCORE	FIRST CASE FOR LARGEST
1 CON01	0.60833	2.42292	3.982876	-4.0000	-1.90	9	4.0000	1.40	5
2 CON02	-1.34167	1.98691	-1.480809	-3.0000	-2.29	72	4.0000	1.24	19
3 CON03	-1.30000	2.29943	-1.768795	-4.0000	-1.17	4	4.0000	2.30	82
4 CON04	-0.21667	2.56080	-11.819083	-4.0000	-1.48	4	4.0000	1.65	7
5 CON05	-0.80000	2.46607	-3.307586	-4.0000	-1.21	4	4.0000	1.81	14
6 CON06	1.25833	2.27332	1.806614	-4.0000	-2.31	57	4.0000	1.21	1
7 CON07	0.45000	2.52086	5.614810	-4.0000	-1.76	3	4.0000	1.41	17
8 CON08	-0.61667	2.30886	-3.744090	-4.0000	-1.47	3	4.0000	2.00	67
9 CON09	-0.80000	2.47543	-3.094282	-4.0000	-1.29	1	4.0000	1.94	11
10 CON10	0.87500	2.46509	2.817248	-4.0000	-1.98	21	4.0000	1.27	2
11 CON11	1.60000	2.60381	1.627382	-4.0000	-2.15	12	4.0000	0.92	1
12 CON12	-1.32500	2.83788	-2.141741	-4.0000	-0.94	2	4.0000	1.88	16
13 CON13	-0.20833	2.33388	-11.199160	-4.0000	-1.83	6	4.0000	1.80	14
14 CON14	-0.09167	2.52382	-27.532604	-4.0000	-1.55	13	4.0000	1.62	10
15 CON15	2.17500	2.20261	1.012692	-4.0000	-2.80	25	4.0000	0.85	1
16 CON16	-0.65000	2.52600	-3.886153	-4.0000	-1.33	21	4.0000	1.84	9
17 CON17	0.34167	2.90927	8.524804	-4.0000	-1.38	59	4.0000	1.81	91
18 CON18	-1.10000	2.07182	-1.883472	-4.0000	-1.40	10	3.0000	1.98	20
19 CON19	-0.89167	2.56609	-2.877855	-4.0000	-1.21	2	4.0000	1.91	35
20 CON20	1.16667	2.52827	2.167090	-4.0000	-2.04	33	4.0000	1.12	2
21 CON21	-0.34167	2.61339	-7.648211	-4.0000	-1.65	27	4.0000	1.98	4
22 CON22	-1.15833	2.04568	-1.766054	-4.0000	-1.39	6	4.0000	2.52	28
23 CON23	1.62500	2.78067	1.711183	-4.0000	-2.02	23	4.0000	0.85	1
24 CON24	-1.45000	2.91785	-2.012268	-4.0000	-1.33	6	3.0000	2.32	3
25 CON25	-0.82500	2.34769	-2.844467	-4.0000	-1.35	7	4.0000	2.06	14
26 CON26	-1.24167	2.33757	-1.882242	-4.0000	-1.18	6	4.0000	2.24	46
27 CON27	0.90000	2.38483	2.649807	-4.0000	-2.05	14	4.0000	1.30	3
28 CON28	0.80000	2.82724	3.534048	-4.0000	-1.70	1	4.0000	1.13	2
29 CON29	1.37500	2.30112	1.673544	-4.0000	-2.34	3	4.0000	1.14	1
30 CON30	-0.34667	2.34048	-6.383142	-4.0000	-1.55	18	4.0000	1.87	36
31 CON31	0.82500	2.49259	3.021273	-4.0000	-1.94	13	4.0000	1.47	12
32 CON32	-0.20833	2.32955	-11.181858	-4.0000	-1.63	5	4.0000	1.81	20
33 CON33	0.62500	2.10664	3.370619	-4.0000	-2.20	7	4.0000	1.60	4
34 CON34	-0.68333	2.19208	-3.208158	-4.0000	-1.54	1	4.0000	2.13	12
35 CON35	0.13333	2.47316	18.548709	-4.0000	-1.67	2	4.0000	1.58	5
36 CON36	-0.84667	2.72534	-3.144617	-4.0000	-1.15	5	4.0000	1.79	11
37 CON37	0.34667	2.26309	3.993682	-4.0000	-2.02	5	4.0000	1.56	2
38 CON38	-0.37500	2.53600	-6.410435	-4.0000	-1.35	4	4.0000	1.80	6
39 CON39	0.34167	2.43229	6.533535	-4.0000	-1.94	7	4.0000	1.64	18
40 CON40	-1.85833	2.96589	-1.947115	-4.0000	-1.10	2	4.0000	3.01	53
41 CON41	-0.14167	2.51482	-14.751029	-4.0000	-1.53	8	4.0000	1.65	16
42 CON42	-0.13333	2.69120	-20.184027	-4.0000	-1.44	1	4.0000	1.54	13
43 CON43	0.11667	2.58042	22.117846	-4.0000	-1.60	4	4.0000	1.50	3
44 CON44	0.85000	2.38571	2.806714	-4.0000	-2.03	49	4.0000	1.32	4
45 CON45	-0.59167	2.18280	-3.689247	-4.0000	-1.56	1	4.0000	2.10	37
46 CON46	-0.41667	2.42391	-5.817389	-4.0000	-1.48	30	4.0000	1.82	5
47 CON47	-1.30000	2.03994	-1.569183	-4.0000	-1.33	14	4.0000	2.60	36
48 CON48	-2.16667	2.14332	-0.989226	-4.0000	-0.86	7	4.0000	2.88	58
49 CON49	1.85833	2.03042	1.092605	-4.0000	-2.89	103	4.0000	1.05	1
50 CON50	-0.65833	2.32088	-3.525388	-4.0000	-1.44	4	4.0000	2.01	6
51 CON51	0.10000	2.36714	23.671420	-4.0000	-1.73	5	4.0000	1.65	3
52 CON52	1.12500	2.44485	2.173425	-4.0000	-2.11	53	4.0000	1.17	3
53 CON53	0.72500	2.77455	3.826648	-4.0000	-1.70	15	4.0000	1.18	4
54 CON54	0.83333	2.59390	3.112674	-4.0000	-1.86	9	4.0000	1.22	3

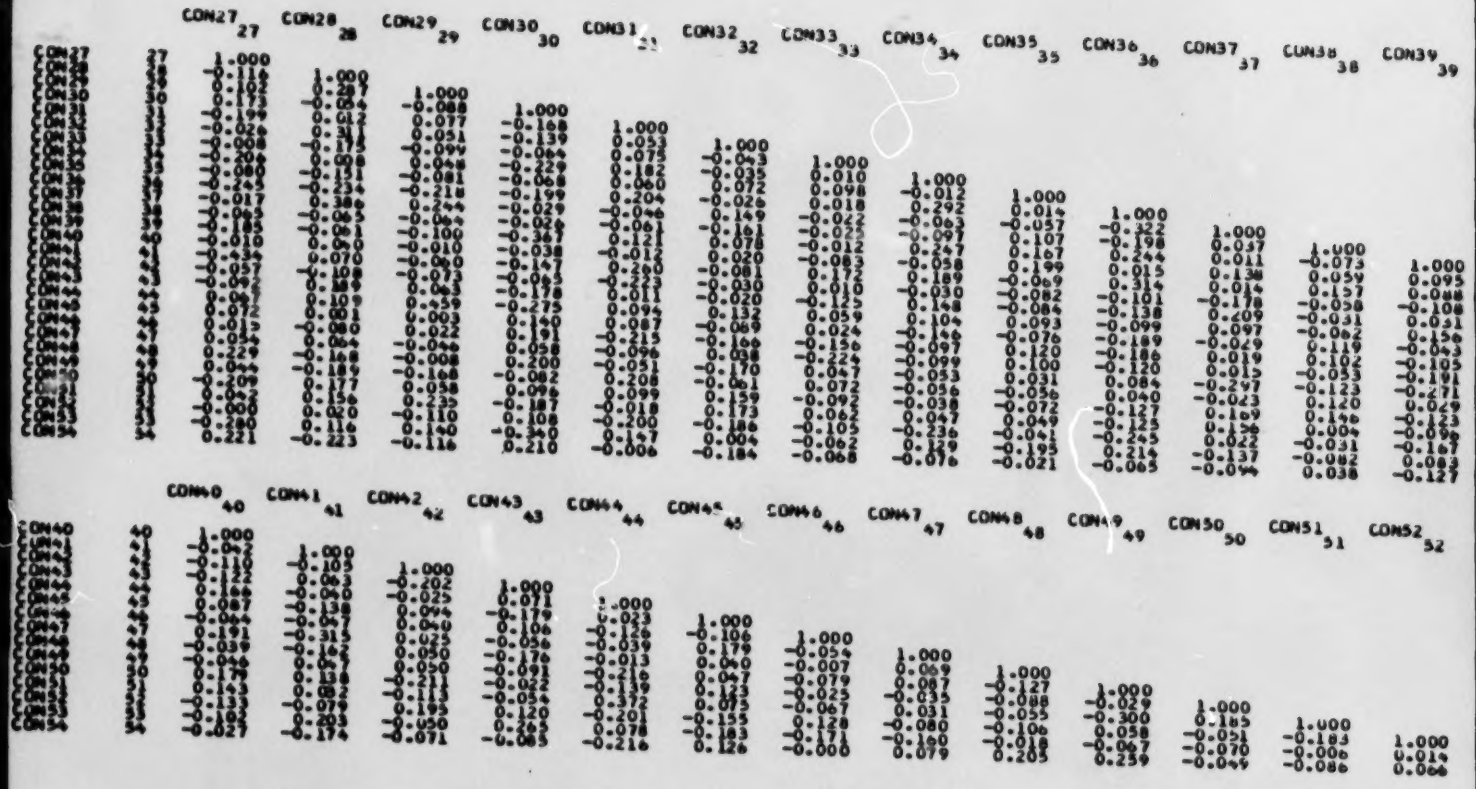
CASE NUMBERS ABOVE REFER TO DATA MATRIX BEFORE ANY CASES HAVE BEEN DELETED DUE TO MISSING DATA.
CASES WITH ZERO WEIGHTS ARE NOT INCLUDED.

CORRELATION MATRIX

		CON01 1	CON02 2	CON03 3	CON04 4	CON05 5	CON06 6	CON07 7	CON08 8	CON09 9	CON10 10	CON11 11	CON12 12	CON13 13
CON01	1	1.000												
CON02	2	0.193	1.000											
CON03	3	0.142	-0.038	1.000										
CON04	4	0.286	0.961	0.236	1.000									
CON05	5	-0.074	-0.032	-0.033	-0.052	1.000								
CON06	6	0.189	0.281	0.156	0.209	0.144	1.000							
CON07	7	-0.147	-0.036	-0.088	-0.129	0.014	0.056	1.000						
CON08	8	-0.035	-0.117	-0.192	-0.178	-0.095	-0.157	-0.105	1.000					
CON09	9	-0.072	-0.079	-0.115	-0.287	-0.052	-0.262	0.053	-0.081	1.000				
CON10	10	-0.079	0.089	0.067	-0.059	0.137	0.150	0.288	-0.192	-0.185	1.000			
CON11	11	-0.149	0.067	0.016	-0.211	0.236	0.195	0.061	-0.076	-0.008	0.122	1.000		
CON12	12	-0.116	-0.244	-0.148	-0.251	-0.065	-0.297	-0.133	0.149	0.299	-0.172	0.020	1.000	
CON13	13	0.218	0.059	0.079	0.447	-0.165	0.005	-0.192	-0.037	-0.303	-0.062	-0.080	-0.083	1.000
CON14	14	-0.121	-0.141	-0.119	-0.123	-0.161	-0.048	-0.182	0.205	0.088	-0.199	0.043	0.164	-0.159
CON15	15	-0.137	-0.277	-0.117	-0.071	0.005	-0.053	-0.051	-0.073	0.086	-0.103	-0.029	0.283	-0.097
CON16	16	-0.041	-0.102	0.289	0.053	-0.089	0.009	0.005	-0.068	-0.264	0.177	-0.026	-0.045	0.050
CON17	17	0.128	0.025	0.066	0.093	-0.103	0.151	-0.098	0.111	-0.082	-0.048	0.085	-0.091	0.139
CON18	18	0.131	0.081	0.200	0.330	-0.102	0.093	-0.001	0.064	-0.134	0.012	-0.151	-0.094	0.269
CON19	19	-0.147	-0.275	-0.106	-0.269	-0.173	-0.349	-0.045	0.072	0.495	-0.261	-0.079	0.380	-0.186
CON20	20	-0.078	-0.158	-0.040	-0.119	0.182	0.238	0.158	-0.237	-0.089	0.262	0.368	-0.108	-0.125
CON21	21	-0.094	-0.051	-0.157	-0.108	-0.103	-0.088	-0.192	-0.004	0.131	-0.094	0.021	0.066	-0.240
CON22	22	0.077	-0.801	-0.032	0.162	-0.002	0.085	-0.118	0.196	-0.088	-0.056	-0.091	-0.009	0.019
CON23	23	-0.203	0.022	-0.114	-0.306	0.001	0.006	-0.045	-0.025	0.105	-0.019	0.224	0.115	-0.320
CON24	24	0.076	0.003	-0.090	-0.099	-0.055	-0.152	-0.312	-0.037	0.155	-0.074	-0.156	0.081	0.024
CON25	25	-0.064	-0.028	0.002	-0.223	-0.086	-0.117	-0.188	0.034	0.082	-0.114	-0.144	-0.047	-0.111
CON26	26	0.204	0.097	0.374	0.290	0.073	0.142	-0.060	-0.157	0.032	0.001	-0.017	-0.227	0.210
CON27	27	0.247	0.200	-0.025	0.061	-0.047	0.264	-0.083	0.152	-0.250	-0.024	-0.009	-0.310	0.170
CON28	28	-0.270	-0.693	-0.151	-0.145	0.039	-0.074	0.293	0.056	-0.104	0.175	0.059	-0.111	-0.061
CON29	29	-0.071	0.054	-0.155	-0.140	-0.152	-0.035	0.044	0.117	-0.142	-0.104	-0.090	-0.239	-0.017
CON30	30	0.231	0.101	0.370	0.448	-0.069	0.214	-0.016	-0.164	-0.244	0.065	-0.159	-0.285	0.397
CON31	31	-0.241	-0.103	-0.135	-0.064	-0.117	-0.194	0.062	0.013	0.116	-0.109	-0.164	0.029	-0.115
CON32	32	-0.167	-0.141	-0.181	-0.223	-0.160	-0.101	0.135	0.127	-0.006	-0.103	-0.033	-0.057	-0.079
CON33	33	-0.050	0.041	-0.036	-0.102	-0.020	-0.106	-0.077	-0.050	0.061	-0.004	-0.008	0.083	0.047
CON34	34	-0.152	-0.062	-0.236	-0.143	-0.101	-0.284	-0.000	0.040	0.370	-0.215	-0.207	0.259	-0.153
CON35	35	0.005	0.036	-0.173	-0.076	0.007	-0.112	-0.104	-0.019	-0.070	-0.074	-0.156	-0.032	0.002
CON36	36	0.021	0.162	-0.153	-0.264	-0.159	-0.131	-0.149	0.195	0.330	-0.178	-0.209	0.005	-0.189
CON37	37	-0.148	-0.086	-0.243	0.061	0.062	-0.087	0.195	-0.161	-0.271	0.266	0.080	-0.214	0.121
CON38	38	0.193	-0.028	0.096	0.157	-0.146	-0.121	0.110	-0.126	-0.107	0.160	-0.167	-0.160	0.078
CON39	39	-0.170	-0.190	-0.255	-0.249	0.054	-0.183	-0.060	0.049	0.273	-0.079	0.167	0.125	-0.215
CON40	40	-0.072	-0.226	-0.206	0.006	0.043	-0.193	0.016	0.063	-0.093	-0.091	-0.125	-0.010	0.010
CON41	41	-0.033	-0.185	-0.071	-0.125	-0.005	-0.244	0.162	-0.037	0.218	0.051	-0.291	0.235	-0.223
CON42	42	0.058	0.082	0.181	-0.166	0.162	-0.048	0.061	0.033	-0.017	-0.048	0.285	0.112	-0.133
CON43	43	-0.102	-0.138	-0.086	0.093	0.232	0.009	-0.029	-0.075	-0.002	0.074	0.045	-0.099	-0.004
CON44	44	-0.192	-0.086	-0.293	-0.213	0.191	-0.168	-0.102	0.117	-0.029	-0.125	0.005	-0.068	-0.145
CON45	45	0.030	-0.044	0.197	0.300	-0.088	-0.049	-0.037	0.008	-0.033	-0.078	-0.080	-0.159	0.169
CON46	46	0.052	0.148	0.103	0.194	0.086	0.148	-0.021	-0.135	-0.129	0.140	0.051	-0.294	0.051
CON47	47	-0.041	0.080	0.052	0.176	-0.122	0.031	-0.107	0.164	-0.184	-0.101	-0.039	-0.092	0.183
CON48	48	0.018	0.049	0.285	0.004	-0.127	0.004	-0.074	0.045	0.036	-0.184	-0.169	0.054	0.075
CON49	49	0.007	0.015	0.047	0.049	-0.195	0.040	-0.184	-0.046	-0.106	0.047	-0.109	-0.015	0.019
CON50	50	-0.133	-0.172	0.011	0.080	-0.148	-0.140	0.141	-0.103	-0.073	0.000	-0.102	-0.123	-0.075

		CON01 1	CON02 2	CON03 3	CON04 4	CON05 5	CON06 6	CON07 7	CON08 8	CON09 9	CON10 10	CON11 11	CON12 12	CON13 13
CON01	1	-0.116	0.181	-0.215	-0.124	-0.041	-0.017	0.103	0.025	-0.164	-0.037	-0.074	-0.124	-0.076
CON02	2	-0.028	0.035	0.054	0.117	0.132	0.134	0.102	-0.160	0.019	0.225	0.196	-0.033	-0.071
CON03	3	-0.206	-0.092	-0.146	-0.236	0.030	-0.094	0.001	0.174	0.151	-0.153	-0.022	0.298	-0.122
CON04	4	0.290	0.001	0.224	0.177	-0.204	0.124	-0.137	-0.138	0.008	-0.081	-0.197	-0.203	0.216

		CON14 14	CON15 15	CON16 16	CON17 17	CON18 18	CON19 19	CON20 20	CON21 21	CON22 22	CON23 23	CON24 24	CON25 25	CON26 26
CON14	14	1.000												
CON15	15	0.044	1.000											
CON16	16	-0.222	-0.185	1.000										
CON17	17	-0.117	-0.011	0.077	1.000									
CON18	18	-0.171	-0.178	0.045	0.101	1.000								
CON19	19	0.188	0.237	-0.234	-0.155	-0.090	1.000							
CON20	20	-0.171	-0.087	0.068	0.058	-0.003	-0.263	1.000						
CON21	21	0.348	-0.069	-0.180	-0.167	-0.141	0.157	0.087	1.000					
CON22	22	0.127	-0.070	-0.106	0.093	0.125	0.088	-0.279	0.153	1.000				
CON23	23	0.104	0.123	-0.135	0.045	-0.257	0.103	0.354	0.192	-0.186	1.000			
CON24	24	0.109	0.074	0.073	-0.057	-0.062	0.141	-0.125	-0.003	0.099	-0.002	1.000		
CON25	25	0.074	-0.071	0.134	-0.059	-0.048	0.065	-0.236	0.144	0.032	-0.021	0.257	1.000	
CON26	26	-0.133	-0.019	0.084	-0.095	0.252	-0.141	-0.110	-0.347	-0.172	-0.164	-0.056	-0.026	1.000
CON27	27	0.043	-0.309	-0.032	0.169	0.292	-0.225	-0.000	-0.046	0.141	0.020	0.047	-0.019	0.178
CON28	28	-0.104	-0.071	-0.152	-0.014	-0.111	-0.138	0.062	0.013	-0.069	0.019	-0.201	-0.177	-0.250
CON29	29	-0.055	-0.030	-0.140	-0.077	-0.026	-0.142	-0.050	-0.016	-0.005	-0.126	-0.167	0.014	-0.049
CON30	30	-0.142	-0.234	0.137	0.109	0.362	-0.202	0.027	-0.170	-0.009	-0.190	0.015	-0.140	0.397
CON31	31	0.188	0.258	-0.112	-0.162	-0.191	0.211	-0.265	-0.095	-0.013	-0.177	0.012	0.021	-0.105
CON32	32	0.078	0.146	-0.046	-0.016	-0.152	0.002	-0.075	0.076	-0.028	0.101	0.030	0.127	-0.144
CON33	33	0.009	0.090	0.109	-0.125	-0.193	-0.051	0.064	0.057	-0.174	0.086	0.184	0.132	0.017
CON34	34	0.086	0.221	-0.247	-0.216	-0.098	0.414	-0.114	-0.023	-0.224	0.032	0.068	0.028	-0.085
CON35	35	0.024	0.044	0.017	-0.012	-0.051	-0.045	-0.121	0.005	-0.021	-0.086	0.257	0.236	-0.230
CON36	36	0.268	0.315	-0.086	-0.151	-0.118	0.394	-0.175	0.068	0.040	0.058	0.148	0.024	-0.115
CON37	37	-0.167	-0.108	-0.009	-0.130	-0.058	-0.278	0.108	0.108	-0.229	-0.005	-0.200	-0.011	-0.052
CON38	38	-0.330	-0.021	0.154	0.120	0.019	-0.219	-0.012	-0.049	-0.040	-0.048	-0.083	0.011	0.022
CON39	39	-0.213	-0.171	-0.153	-0.160	-0.318	0.250	-0.098	0.116	-0.030	0.107	0.095	0.109	-0.121
CON40	40	-0.014	-0.106	0.067	0.102	-0.063	-0.059	-0.162	-0.000	0.077	-0.093	0.058	0.041	-0.220
CON41	41	-0.070	0.211	0.055	-0.155	-0.300	0.151	-0.132	0.020	-0.143	0.019	-0.092	-0.013	-0.173
CON42	42	-0.179	-0.129	0.168	-0.012	0.047	0.048	0.216	-0.049	-0.068	0.066	-0.103	-0.019	-0.027
CON43	43	-0.107	0.094	-0.238	-0.158	-0.139	-0.088	0.085	-0.062	-0.242	0.130	-0.163	-0.080	-0.030
CON44	44	0.014	0.029	-0.186	-0.182	-0.238	-0.006	-0.102	0.022	-0.024	0.083	0.011	0.030	-0.212
CON45	45	-0.018	-0.363	0.070	-0.070	0.254	-0.122	-0.171	-0.148	0.086	-0.279	-0.048	0.012	0.148
CON46	46	-0.192	-0.180	0.071	0.087	0.124	-0.117	0.106	0.067	-0.063	-0.109	-0.169	-0.009	0.033
CON47	47	0.120	-0.220	0.047	0.029	0.272	-0.011	-0.051	0.055	0.200	-0.152	-0.050	-0.085	-0.128
CON48	48	0.056	-0.108	0.006	0.074	0.110	0.095	-0.237	-0.141	0.134	-0.085	0.031	0.001	0.240
CON49	49	-0.024	0.060	0.242	-0.060	0.019	-0.089	-0.010	0.092	0.033	-0.129	-0.025	0.130	-0.026
CON50	50	-0.035	-0.009	0.090	0.030	-0.038	0.009	-0.110	0.028	0.004	-0.083	-0.010	-0.114	-0.022
CON51	51	0.076	-0.220	-0.090	-0.042	-0.169	-0.140	-0.080	-0.038	-0.049	0.054	0.051	0.050	-0.088
CON52	52	-0.222	-0.127	0.040	0.119	0.089	-0.183	0.269	-0.101	0.059	0.066	-0.145	-0.163	0.046
CON53	53	0.075	0.371	-0.087	-0.084	-0.291	0.152	-0.093	-0.110	-0.086	0.090	-0.069	-0.075	-0.076
CON54	54	-0.031	-0.193	0.035	0.001	0.100	-0.024	-0.018	0.030	0.020	-0.224	-0.008	-0.082	0.178



		CON53 53	CON54 54
CON53	53	1.000	
CON54	54	-0.165	1.000

ROTATED FACTOR LOADINGS (PATTERN)

		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8
CON01	1	-0.182	0.137	-0.229	-0.175	-0.455	0.039	-0.107	0.043
CON02	2	-0.415	-0.001	0.036	0.163	-0.368	0.008	0.092	-0.185
CON03	3	-0.094	0.595	0.032	-0.289	-0.062	-0.066	-0.161	-0.117
CON04	4	-0.327	0.144	-0.520	-0.268	-0.203	-0.296	-0.177	0.086
CON05	5	-0.063	-0.145	0.293	0.297	-0.201	-0.144	-0.259	-0.111
CON06	6	-0.418	0.046	0.171	-0.095	-0.335	-0.260	0.013	-0.014
CON07	7	-0.025	0.080	0.163	0.083	0.488	-0.276	-0.168	-0.201
CON08	8	0.239	0.031	0.002	0.281	-0.010	0.021	0.113	0.529
CON09	9	0.509	0.024	0.096	-0.079	-0.034	0.019	0.328	-0.283
CON10	10	-0.288	-0.093	0.239	-0.197	0.215	-0.092	-0.301	-0.192
CON11	11	-0.140	-0.089	0.644	0.011	-0.038	-0.186	0.049	0.005
CON12	12	0.716	-0.044	0.165	-0.102	-0.057	0.033	0.033	0.142
CON13	13	-0.251	0.162	-0.441	-0.059	-0.238	-0.119	-0.187	0.185
CON14	14	0.160	-0.090	-0.025	-0.026	0.023	0.123	0.642	0.161
CON15	15	0.538	-0.318	-0.096	-0.028	-0.155	-0.126	-0.105	-0.123
CON16	16	-0.095	0.252	0.122	-0.281	0.186	0.313	-0.481	0.063
CON17	17	-0.094	0.024	0.092	-0.045	-0.173	-0.083	-0.264	0.437
CON18	18	-0.222	0.424	-0.160	-0.151	-0.120	-0.200	-0.028	0.232
CON19	19	0.627	0.059	-0.017	-0.084	0.047	0.036	0.404	-0.019
CON20	20	-0.308	-0.162	0.587	-0.159	-0.024	-0.184	-0.072	-0.206
CON21	21	-0.095	-0.349	0.121	-0.267	0.142	0.148	0.532	0.060
CON22	22	-0.004	0.032	-0.113	-0.087	-0.089	-0.021	0.164	0.563
CON23	23	0.066	-0.239	0.532	0.043	-0.029	0.031	0.202	-0.146
CON24	24	0.097	-0.032	-0.090	-0.036	-0.203	0.531	0.087	0.028
CON25	25	-0.006	-0.038	-0.030	0.012	0.002	0.595	0.075	-0.040
CON26	26	-0.131	0.560	-0.170	0.002	-0.261	-0.123	-0.072	-0.370
CON27	27	-0.477	0.233	0.013	0.161	-0.298	0.066	0.223	0.205
CON28	28	-0.109	-0.187	0.034	0.304	0.536	-0.390	-0.007	0.047
CON29	29	-0.155	-0.043	-0.133	0.638	0.117	-0.116	0.009	-0.021
CON30	30	-0.356	0.465	-0.233	-0.225	-0.113	-0.172	-0.109	-0.022
CON31	31	0.321	-0.105	-0.367	0.042	0.214	0.061	0.113	-0.176
CON32	32	-0.003	-0.154	0.030	0.187	0.382	0.075	0.180	0.126
CON33	33	0.026	0.023	0.081	0.025	-0.044	0.482	-0.092	-0.306
CON34	34	0.441	-0.110	-0.178	0.157	-0.001	0.003	0.247	-0.300
CON35	35	-0.058	-0.283	-0.126	0.013	-0.132	0.491	-0.138	0.148
CON36	36	0.684	-0.060	-0.055	-0.149	-0.148	0.135	0.195	0.033
CON37	37	-0.399	-0.350	-0.105	0.114	0.426	-0.151	-0.083	-0.155
CON38	38	-0.122	-0.089	-0.212	-0.192	0.102	0.133	-0.476	-0.059
CON39	39	0.277	-0.412	0.045	-0.013	-0.020	0.208	0.198	-0.094
CON40	40	-0.016	-0.178	-0.169	0.089	0.235	0.218	-0.174	0.426
CON41	41	0.459	-0.191	-0.155	-0.092	0.246	0.043	-0.266	-0.347
CON42	42	0.090	0.332	0.566	-0.030	0.008	0.061	-0.169	0.106
CON43	43	-0.041	-0.397	-0.107	0.191	-0.173	-0.418	-0.015	-0.300
CON44	44	-0.024	-0.207	0.010	0.708	0.013	0.220	0.052	0.025
CON45	45	-0.193	0.424	-0.253	0.013	0.244	0.107	0.004	0.111
CON46	46	-0.307	-0.069	0.020	-0.127	-0.177	-0.119	-0.174	-0.074
CON47	47	-0.209	0.078	-0.113	-0.077	0.107	-0.079	0.196	0.525
CON48	48	0.103	0.600	-0.059	0.144	-0.210	0.083	0.120	0.082
CON49	49	-0.041	-0.106	-0.110	-0.513	0.008	0.165	-0.010	0.012
CON50	50	-0.038	0.015	-0.260	-0.096	0.555	-0.085	-0.068	-0.023

		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8
CON51	S1	-0.216	-0.030	-0.059	0.531	0.269	0.230	0.073	-0.038
CON52	S2	-0.144	-0.029	0.141	-0.242	-0.112	-0.341	-0.239	-0.008
CON53	S3	0.530	-0.164	0.029	0.275	-0.072	-0.271	-0.091	-0.056
CON54	S4	-0.221	0.253	-0.268	-0.339	-0.168	0.012	0.200	-0.065
	VP	4.625	3.120	2.981	2.787	2.679	2.581	2.522	2.423